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# Electrical Review

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## What Constitutes Station Cost

TO the average person who visits a power plant, the cost of the installation is a very simple conception with respect to the kind of items it is supposed to include. Without understanding the names and functions of equipment units, such a visitor will admit readily enough that in putting down the total expense of constructing a station, all the visible physical property should be included. Boilers, turbines, switchboard apparatus, building, pumps and coal-handling machinery embrace the main items that the layman will point to if asked to suggest the component parts of the investment.

Now what the layman thinks about such matters is of more consequence than some engineers appreciate, especially those operating men employed by public utility corporations. The average of intelligence among business men and others who visit stations from the standpoint of municipal interest, concern in rate cases, etc., is much higher than it used to be with respect to the appreciation of the fundamentals of power-plant engineering. Any operating engineer who may at some time be concerned in the preparation of evidence for use before a commission or other public board owes it to his employer to make clear when occasion offers that the physical equipment costs are only a part of the total investment required in order to build a complete station. With the spread of public utility regulation, persons interested in these investment costs are by no means rare visitors to power plants, and their inquiries deserve to be treated with the utmost respect.

It is not the purpose of these comments to itemize the intangible elements of station costs, but a few of these which do not occur to the layman may be touched upon as drawn from a recent analysis of plant investment. The station in question cost about $300,000, and it is interesting to note the very appreciable outlays involved in many items which the non-expert visitor might overlook only to go home with the idea that the plant owner has grossly overcapitalized his installation. It is to the engineer's interest, even if it is a little indirect, that the plant owner shall be allowed to earn a fair return upon the legitimate cost of his installation.

In this plant preliminary engineering cost $7000; subsurface foundations, entirely out of sight to the chance visitor, cost $9400; interest during construction came to $3700; insurance during construction was $840; over $1000 worth of coal was used in the period of station erection and in testing the turbo-units before turning them over to commercial service; miscellaneous material, hardware and other odds and ends of supplies came to $1500; drafting and blue prints required in the home office and field office reached nearly $2000; to say nothing of legal expenses and the cost of transferring certain equipment from an old station to a new one. Opinions might differ as to the propriety of capitalizing the cost of the coal used in getting the machinery up to concert pitch, so to speak, and there might be some question as to the capitalization of the wages of the chief engineer during the construction period. This was advanced as proper in the case of the plant in mind, for the reason that the chief engineer was withdrawn from service in an older station of the company and put into the new plant during the construction period, in order to better acquaint him with every detail of the installation as it progressed. A new man was employed to take his place in the old plant, and so the company claimed that the extra wages were a proper part of the cost of building the new station. The items cited are merely some of the costs which might very easily be overlooked in appraising a plant from the point of view of the layman, and in discussing such issues, it is well worth while to lay some stress upon the importance of the intangible (from the outsider's viewpoint) elements in the plant investment.

## Consistent Pro-Rating of Cost

IN electric service rate cases it is often necessary to attempt to determine the cost of handling a particular branch of company business. Such a task demands the highest professional skill of both the engineer and the accountant. We may admit at the outset that a strict mathematical solution of such a problem is next to impossible; that at best, classified service cost in toto must be estimated. This does not mean that figures of this kind are worthless, as opposing attorneys like to claim. It does mean that all data and computations presented to support a given cost theory should be consistent. One engineer may determine the proportion of substation operating expense due to the street-lighting load by pro-rating the payroll and supply budget in the proportion of the relative kilowatt-hours used in commercial and in street-

lighting service. Another may prefer to estimate the attendance required and add the supply account of the street-lighting business, and a third may pro-rate in proportion to the installed capacity for each class of service. Whatever the basis, however, the process of reaching the result must be consistent at every step with the theory adopted if the computations are to be regarded with confidence under cross-examination. More than this, if the reasons for selecting a particular method of pro-rating can also be set forth logically and clearly, the chances of acceptance will be greatly increased.

## *Inter-Station Energy Contracts*

THE centralization of electric generating facilities is today a factor in the development of many small lighting and power companies, no less than in the progress of their customers. In other words, the small central station in numerous cases is becoming the customer of the larger one, thanks to the development of the high-powered steam turbine, of transmissions. This means that the manager of the hydroelectric plants and their associated high-voltage small company who is called upon to sign a contract for the supply of electricity from another utility organization must bear in mind a good many points before he closes his part of the transaction. The factors to be considered in preparing such a contract for inter-station service are of much interest.

While no standard contract may be intelligently advocated for all cases of this kind, it is helpful to examine the essential features of a recent agreement between two central-station companies from the engineering standpoint. The preamble set forth the proposed use of purchased energy and the reasons for such action on the part of the smaller company. This contributed to a better understanding of the conditions affecting the contract, and was a desirable matter of record.

The term of the contract and provision for its automatic continuation after nominal expiration was the first point specified. Next followed statements as to character of electrical energy to be delivered and the general standard of service required; a clear definition of the point of delivery and the point at which the supply should be measured. A section was then devoted to a comprehensive statement of the amount of energy to be delivered under the agreement and the amount which the purchasing company guaranteed to use and pay for. In the particular case in hand, provision had to be made for the re-sale of electricity to still another power-producing organization. One of the most important sections then followed, discussing in considerable detail the arrangements for measuring the supply, for testing and for calibrating meters, including an agreement as to who should bear the cost of testing and recalibration in case of errors of stated amount above and below the standard. Along with this went a clear-cut statement of the method to be adopted in adjusting bills in the event of meter errors of specified magnitude.

Another section explained the ownership of lines and other equipment involved in the supply from one company to the other, with rental provision covering a section of line owned by the seller. The contract was careful to state just when energy might be used by the purchaser, with reference to certain occasions set forth in which the supply might be derived in part at least from other sources. Then came a clearly-worded statement of the price of electricity and the annual obligations of the purchasing company, with a discussion of certain factors by which the base rate might be modified. A section dealt with the rendering of bills and their payment, followed by paragraphs agreeing that the purchaser's system shall be so operated as not to seriously endanger or interfere with the service of the supply company, including a maximum permitted unbalancing of 15 per cent in current in any phase compared with the average current in the three phases at the same time; covering the right of mutual access to each company's premises, and setting forth the responsibility of the selling company for the maintenance of service. Under the last item it was clearly stated that the regular customers of the selling company should have the preference of supply in case of equipment trouble, a point which was clearly of local acceptance, since many managers of small utilities could not in other cases be expected to agree to such a provision unless paying a rate for what might be called secondary power. As the maximum rate under the contract was one cent per kilowatt-hour, it is safe to assume that the foregoing provision regarding preferential customers was closely associated with the low price agreed upon.

The concluding sections set forth the mutual agreement of the parties to secure all franchises, rights of way, etc., necessary for the delivery of energy; further responsibilities of each party with respect to the boundaries of each system and maintenance of equipment and service within these; provision for arbitration and assignment of contract. It is entirely feasible to prepare an agreement of this kind, so simple and yet so complete from the engineering point of view, that the reader would question whether the legal profession (as its handiwork often appears) had anything to do with the formulation of terms. Bearing in mind the main points outlined above, the small-company manager confronted with the opportunity to purchase electricity at low cost need have no hesitation in drafting an agreement that meets his ideas, which may very properly be passed upon by the company's legal counsel for the good of all concerned, but which sets forth in true man-fashion just what the two parties propose and promise to do. When one carries through an agreement of this kind, free from the complications which sometimes burden such contracts, it generally appears from the wording that each party is benefited by the transactions.

# HAPPENINGS IN THE INDUSTRY

***Merger of Los Angeles Utilities Approved by Commission—Jovian Order Perfects Insurance Plan for Members—Save Fuel by Using Water Power—March Exports Set New Record—Miscellaneous Notes***

## MERGER OF LOS ANGELES UTILITIES APPROVED.

**Southern California Edison and Pacific Light & Power Corporation Combine—Changes in Personnel of Officers.**

Following authority granted by the Railroiad Commission, the Southern California Edison Company and Pacific Light & Power Corporation have consolidated, all outstanding bonds and indebtedness of the Pacific Light & Power Corporation being assumed by the Edison Company and cash and stock of the Edison Company delivered for capital stock of the Pacific Light & Power Corporation.

The total capitalization of the enlarged Southern California Edison Company is now $77,000,000—divided into $38,000,000 of stock and $39,000,000 of bonds, debentures and notes.

Henry E. Huntington's interests are represented on the board of directors of the enlarged Southern California Edison Company and the new board consists of the following: John B. Miller, H. E. Huntington, W. A. Brackenridge, Albert W. Harris, W. E. Dunn, George I. Cochran, J. C. Drake, William R. Staats, Arthur H. Fleming, Henry M. Robinson, J. H. Fisher and Howard E. Huntington.

After a special meeting of the new board the following officers were announced: John B. Miller, president; W. A. Brackenridge, vice-president and general manager; R. H. Ballard, vice-president and assistant general manager; George C. Ward, formerly vice-president of the Pacific Light & Power Corporation, becomes vice-president of the new company; George I. Cochran, J. C. Drake and William R. Staats continue as vice-presidents; H. H. Trowbridge, general counsel; S. M. Kennedy, general agent; A. N. Kemp, comptroller; W. L. Percey, treasurer; A. E. Morphy, secretary; B. F. Pearson, general superintendent of the Southern division; E. R. Davis, general superintendent of the Northern division; John Otto, purchasing agent; D. M. Trott, assistant comptroller; B. T. Story, assistant treasurer; C. P. Staal, auditor.

Both of the companies operate at Los Angeles and vicinity. The Pacific Light & Power Corporation's property is valued by company engineers at $32,921,392; and the properties of the Southern California Edison Company at $30,311,328, or a combined total of about $63,232,720. The engineers of the Commission place a total valuation of $54,018,235.50 on the aggregate properties, and reproduction cost, less depreciation, of $45,266,386.54. The combined system consists of 13 hydroelectric power plants and five steam plants, with total generating capacity of about 300,000 horsepower. There are 1500 miles of transmission lines from Big Creek, Kern River and other points reaching to Los Angeles, 3700 miles of distributing lines and about 100 substations. The companies, together, serve about 150,000 consumers with varying character of load from regular commercial lighting and power service to irrigation and mining work.

The estimated annual saving as a result of the consolidation is placed at $400,000. On this point the Commission says:

"It is proposed to completely consolidate these plants and to operate hereafter as a unified whole, thus greatly decreasing operating expenses. The benefits of the consolidation to the public will be the elimination of the necessity for duplicate facilities and the greater efficiency made possible by the serving of a great community by one plant and organization. Furthermore, the great, and probably increasing, proportionate decrease in operating expenses will make it possible in the future for the consolidated company to serve its consumers at lower rates.

The Southern California Edison Company has a total capitalization and debt of $34,248,601.64, and the Pacific Light & Power Corporation $51,108,496.30, or a total of $85,357,097.94. By this merger, the only other central station of note in the local field is the Los Angeles Gas & Electric Company, which serves certain sections of the city. Also, in the future there will be the municipal power from the city aqueduct project.

## JOVIAN ORDER ADOPTS INSURANCE PLAN FOR MEMBERS.

**Arrangements Made for Accident and Health Insurance for Members at a 50 Per Cent Saving.**

It has long been believed by the Jovian Order that the members would welcome some form of insurance in connection with membership in the Order. During the past two years every conceivable insurance feature has been carefully analyzed by the Jovian central office, and one after the other rejected as impractical or undesirable.

These included the plan used by some organizations of arbitrarily adding a certain sum to each member's dues, and then giving him a certain kind of insurance policy whether it did or did not appeal to him. Still another was the class of accident insurance provided by several existing state associations at a minimum premium of nine dollars annually. The fact that exemption of certain classes of accidents is made in order to furnish the insurance at that rate, and that the insured is obligated to pay additional assessments if they become necessary, seems to make that form of policy undesirable for the purposes of the Order.

And then, six months ago, the Jovian central office headed in the right direction, and now announces a big, new feature that has been created for the benefit of Jovians. It is far and away the greatest single advance that has ever been made in Jovianism for the advantage of the individual member, and probably the biggest coup ever put over by any association for the direct gain of its members.

### Details of Plan.

The plan as completed provides for Jovians a tangible, direct return that in countable, bankable dollars and cents is several times the amount of the present annual dues of four dollars.

With this plan alone, laying aside all other Jovian advantages, the minimum, actual saving in money because of Jovian

membership is $13 and the maximum, actual saving in money because of Jovian membership is $41.

In other words, if a Jovian accepts the minimum proposition offered he can pay his Jovian dues of $4.00 and still be $9.00 bettter off in pocket than if he were not a Jovian. If he accepts the maximum proposition he can pay his Jovian dues and still be $37 better off in pocket than if he were not a Jovian.

The proposition is as follows:

(1) Any Jovian in good standing may by application to the Jovian central office now secure accident insurance, substantially identical with the $25 policies issued by the three largest accident companies, upon payment of a premium of only $12.

(2) Or, in the same manner a Jovian may secure health insurance of a market value of $35 for $20.

(3) Or, one accident and one health policy—net saving $28.

(4) Or, two accident policies—net saving $26.

(5) Or, two accident and one health policy—net saving $41.

How Applications Are Made and Policies Handled.

Application is made by a Jovian to the Jovian central office upon a simple form furnished Jovians upon request.

The insurance is placed with the Employers' Indemnity Corporation, a thoroughly reliable and financially substantial concern described hereinafter.

There is no mystery attached to the reason why this insurance can be sold to Jovians at so much less than it can be purchased in the open market. It is not because the policies are not equally desirable. It is not because the Employers' Indemnity Corporation is writing this business without a reasonable profit.

The saving is made because the insurance is going direct from the insurance company to the individual minus any agents' commissions and minus any office detail expense. The Jovian central office, as a direct service to Jovians, is filling the place usually occupied by general and sub-agents and is taking care of office and collection details without charge.

Thus, this insurance is going direct from the source to the purchaser stripped bare of every expense save only adjustments, actual losses and a reasonable return to the insurance company.

The Policies.

Space here does not permit a complete schedule of all the benefits provided by these policies. Investigation will prove the assertion that they are substantially the same as any policies to be purchased elsewhere at approximately twice their cost.

The general provisions are exceedingly liberal. For example, they create a Jovian Board to hear any case of possible dispute.

The policies are written and lithographed especially for The Jovian Order (showing the Jovian emblem) and are purchasable only by Jovians in good standing.

These policies must not be confused with those issued by assessment companies and state associations. Those policies carry many exemptions and limitations of certain classes of accidents, and the insured is liable for assessment in addition to the premium.

There are no exemptions in the Jovian policies. A Jovian is fully covered regardless of the character of the accident or the circumstances surrounding it. There are no additional assessments or charges possible.

The company writing this insurance (Employers' Indemnity Corporation) has a financial standing and a reputation for fair dealing that is second to none.

This is a branch of the Utilities Indemnity Exchange, which is so successfully serving the National Electrical Contractors' Association members and hundreds of utility companies with liability and automobile insurance.

## SAVE FUEL BY USING WATER POWER.

**Secretary Lane Urges Maximum Development of Water Powers to Conserve Coal and Oil.**

Secretary Franklin K. Lane of the Department of the Interior, in reply to a recent letter from the manager of an electric light and power company, made the following statement as to the policy which such companies should follow during the war in the production of electrical energy:

"The unusual demands arising from the entrance of the United States into the war and the necessities of the allied governments have made the situation in this country acute. We must not only supply large additional amounts of fuel for the manufacturing industries including munitions of war, but we must to a certain extent furnish fuel to our allies. The stimulation of production, the regulation of distribution, and, within economic limits, the elimination of unnecessary consumption of fuel, are therefore problems of national interest and of immediate concern.

"Although it will be necessary to use the coal and oil now being produced to the highest possible advantage, it must be recognized that the requirements of the nation for energy are increasing rapidly, especially in regions of great industrial activity. Obviously, immediate conservation of fuels can best be accomplished by utilizing all available water power. New requirements for power should therefore be met so far as practicable by the installation or enlargement of hydroelectric plants; present requirements should be satisfied by substituting all available water power for steam-generated energy requiring coal and oil for its production. This means that all water available at water-power plants should be made to produce energy up to the practicable hydraulic capacity of the works and the requirements of the population and industries within transmission distance of the site. In regions where water power can be made available, steam-power plants should be operated only to carry loads in excess of those that can be carried by water-power plants. In my opinion this course should, under existing conditions, be followed by all power companies, regardless of the fact that at the moment it may be cheaper for the company to produce steam power."

## THE SOCIETY OF INDUSTRIAL ENGINEERS FORMED.

**New Organization of Efficiency Experts to Tender Services to Government.**

The Society of Industrial Engineers, a permanent, national organization, the membership of which is to comprise men and women who are industrial engineers, professional technical engineers, accountants, managing executives of commercial and industrial activity, writers, educators and students, was perfected into an organization in Chicago on May 26. The society will be permanently organized in Washington, D. C., June 15, on which date the directors have been called to meet.

Charles Buxton Going, formerly editor of the *Engineering Magazine*, New York, was chosen provisional president and pro tem chairman of the board of directors which was chosen at the organization session. This board comprises 15 prominent men from various sections of the United States, the majority of whom have accepted.

Temporary committees are now at work. Upon completion of the organization its services will at once be tendered to the government, through Howard E. Coffin, chairman of the advisory committee, Council of National Defense, and such other committees as can utilize the services of the Society of Industrial Engineers.

The temporary executive committee consists of Irving A. Berndt, chairman; F. M. Simons, Jr.; H. Thorpe Kessler, H. A. Rose, G. C. Dent, Harry Franklin Porter, C. A. Knoep-

pel, Willard E. Hotchkiss, S. T. A. Loftis and Charles Buxton Going.

G. C. Dent is temporary secretary and H. Thorpe Kessler, treasurer. Temporary headquarters are established at 327 South La Salle street, Chicago, in charge of the temporary secretary.

## MARCH ELECTRICAL EXPORTS RECOVER FROM FEBRUARY DEPRESSION AND SET NEW RECORD.

### Striking Evidence of the Failure of Submarine War in Attempt to Throttle Foreign Trade.

The slight depression in the electrical export shipments from the United States in February due to the checking of all foreign trade because of renewal of violent submarine war was not only more than made up in the March totals just made public, but the latter actually set another new monthly record. In total value of electrical shipments March exceeded the January record by nearly six per cent. As compared with March of 1916, the new record month shows an increase of over 80 per cent. Last February's total showed an increase of over 40 per cent compared with the corresponding month of a year ago.

The following detailed and comparative figures show these facts in a very striking manner:

| | February | | March | |
|---|---|---|---|---|
| Articles. | 1917. | 1916. | 1917. | 1916. |
| Batteries | $ 227,105 | $ 104,712 | $ 380,992 | $ 157,497 |
| Dynamos & generators | 277,953 | 112,965 | 132,760 | 72,022 |
| Fans | 66,243 | 30,637 | 18,004 | 18,376 |
| Insulated wire and cables | 526,879 | 217,764 | 719,639 | 269,606 |
| Interior wiring supplies, etc. (including fixtures) | 72,524 | 133,500 | 80,579 | 69,981 |
| Lamps— | | | | |
| Arc | 842 | 1,761 | 4,015 | 3,191 |
| Carbon-filament | 13,248 | 12,898 | 12,505 | 9,548 |
| Metal-filament | 153,475 | 107,715 | 176,577 | 86,894 |
| Meters and other measuring instruments | 105,943 | 59,170 | 99,509 | 63,824 |
| Motors | 335,093 | 439,769 | 572,733 | 473,771 |
| Telegraph instruments (including wireless apparatus) | 18,324 | 2,542 | 135,775 | 19,703 |
| Telephones | 157,796 | 105,176 | 151,739 | 180,534 |
| Transformers | 84,105 | 86,414 | 116,347 | 87,520 |
| All other | 1,486,739 | 1,097,631 | 2,597,989 | 1,372,408 |
| Total | $3,526,269 | $2,512,654 | $5,199,163 | $2,884,875 |

## PLAN FOR THOMSON MEDAL FUND ISSUED BY N. E. L. A. COMMITTEE.

### Class B and E Members Asked to Contribute to Promote Studious Effort and Progress Among Younger Men.

L. D. Gibbs, chairman, and Frank A. Birch, composing a committee of the National Electric Light Association to secure subscriptions to the Thomson scholarship fund, have written to Class B and E members suggesting that they take a voluntary part in the movement.

The fund is to be $5,000. It is proposed as a recognition of the eminently helpful work of Prof. Elihu Thomson. Suggested by Past-president E. R. Weeks, the plan adopted was worked out by a committee of which Charles L. Edgar was chairman and John F. Gilchrist, J. W. Lieb and Mr. Weeks members.

This medal is to be awarded "in any year to any citizen of the United States or Canada who at the time of the award shall not be over thirty-five years of age, and who, in the judgment of the trustees of the medal, shall have made a notable contribution to electrical science or its industrial applications through original investigation, research or discovery, or through whose direct efforts a substantial contribution to the advancement of the industry shall have been accomplished."

## THE ELECTRIC TRAPSHOOTERS WHO NEVER MISS ARE NO MORE.

### Famous Atlantic City Electric Sign Changed to Stimulate Interest.

For the past 16 months, from sunset to sunrise, the electrically operated trapshooters on what is claimed to be the world's largest and most spectacular electric sign—located on the Million Dollar Pier, Atlantic City, N. J., have fired at 10 targets a minute and recorded a hit every time.

Human trapshooters are not equal to the task of breaking every target thrown. Mechanisms, of course, can be made almost infallible, but from now on the electrical trapshooters are to be more realistic and more human than ever. They will miss at irregular intervals.

Thousands of persons seat themselves on the spacious hotel verandas and many more mass on the boardwalk every night trying to figure out when the shooter will miss. Sometimes the misses are as many as two or three in thirty seconds—while at other times the misses are not more than two in the same number of minutes. Therefore it is difficult to work out a system and play it.

Figuring out "when the shooter misses" has become quite a game in Atlantic City and every one is playing. You cannot help but enthuse and get into the game after watching the electrical display. It is only human to try and solve the puzzle—and ascertaining just when the shooter misses is a puzzle. Thousands check up the misses each night, keeping tabs by the hour, but on no two nights thus far has the rotation of misses been the same.

It took five months to perfect the scheme of having the shooters miss and the changes had to be made so as not to affect the operation of the sign. The ironwork was extended 10 feet and several hundred additional lights are now in operation.

This is the second change that has been made in the working of the great sign since it was first shown to public view on January 4, 1916. The original shooter was a man. Then the idea was suggested to have a woman alternate with the man in firing at the targets. This wonderful accomplishment was perfected and the fair Diana began alternating with the male shooter several months after the first operation of the sign.

There are 4000 lights in the entire sign, which is 50 by 100 feet. The figures of the shooters are 21 feet high. The trap puller is 18 feet 6 inches tall. The target is 15 inches in diameter. The sign cost upwards of $100,000.

There are six operations to the sign, each one taking about one second. First the green lights come on, producing a lawn effect, and then in order appears the trapshooter, who places his gun to his shoulder and aims as the trap puller rises behind him. The puller throws the lever, which releases the target. One soon learns whether the target is hit or missed. When hit the target bursts into hundreds of small lights, looking for all the world like the fragments of a target. When the target is missed it travels the length of the sign and disappears into the night.

## Ohio Electric Light Association Cancels Annual Convention.

The executive committee of the Ohio Electric Light Association at its meeting in Cleveland, Ohio, June 1, decided in view of the war conditions now existing in our country to cancel the date of the annual convention at Cedar Point in July and to not hold a convention in 1917.

This action was taken after very careful consideration and excepting for cancelling the annual convention, all activities of the association will be continued in full force and vigor during the coming year.

# NEWS NOTES

**California Has 18 Municipal Plants.**—According to the annual report of the state comptroller, a total of 18 cities in the state of California own their own light plants. These plants earned $842,636.05 in 1916.

**Steam Heating Operations of Electric Company Not Taxable.**—Judge George Kunkel, Harrisburg, Pa., has overruled exceptions filed to his opinion holding that the state cannot tax the Harrisburg Light & Power Company on receipts of its steam heating operations under the law of the state. The case, it is said, will be carried by the state to the supreme court.

**New Members for Underwriters' Council.**—Underwriters' Laboratories announces as additions to its Casualty Council the following well-known authorities in this line: Col. Lewis T. Bryant, Commissioner of Labor of the State of New Jersey, Trenton, N. J. Lew R. Palmer, Department of Labor and Industry, Harrisburg, Pa., and Albert H. Young, Director of the American Museum of Safety, New York, N. Y.

**Summer Sessions at Wisconsin.**—The nineteenth annual summer session of the College of Engineering of the University of Wisconsin will be held at Madison during the six weeks period beginning June 25, 1917. Special courses will be given in chemistry, electrical, steam and hydraulic engineering, gas engines, machine design, mechanical drawing, mechanics, shop work and surveying. All courses given in the summer session are open to engineering students. Special courses have been arranged for engineering, manual arts and vocational teachers. For information, address F. E. Turneaure, dean, Madison, Wis.

**Increased Production of Mica in Southern India.**—The quantity of mica produced by the mica mines in Nellore and Salem, Madras Presidency, India, in the year ended June 30, 1916, was 505,037 pounds as compared with 331,563 pounds in 1914-15. The exports in the year ended March 31, 1916, were 576,240 pounds, valued at $121,700 (all to the United Kingdom); in 1914-15, 621,376 pounds, valued at $153,109 (133,616 pounds to Germany and 4592 pounds to the United States); in 1913-14, 1,217,552 pounds, valued at $274,479, of which 688,576 pounds went to the United Kingdom, 481,600 pounds to Germany, 34,944 pounds to Holland, 11,872 pounds to United States and 560 pounds to other countries. An official report says that the high value of the mica market is now inducing miners and merchants to direct their attention to the industry and that there has been a perceptible revival, especially during the latter part of the year.

**Popular Lecture on Store Lighting.**—The Illuminating Engineering Society announces that the popular lecture on "Store Lighting" is now ready for delivery to those who wish to present this phase of the art and science of lighting. The lecture is designed to fit the need of anyone who is called upon to present the principles involved and the advantages of a well lighted shop, store, show window or showcase. The manuscript covers some 20 typewritten pages and is accompanied by 60 lantern slides illustrating actual lighting equipments and showing diagrams of various types of lamps, globes, shades, reflectors and fixtures. All of these are descriptive of equipments for store installation. The lecture may be reserved for presentation upon application to the Illuminating Engineering Society, 29 West 39th Street, New York City. Another lecture, on "Home Lighting," will be available within a short time, while the Committee on Popular Lectures is actively engaged in the completion of lectures on other phases of illumination. A nominal charge is made to cover cost of mailing, etc.

**Kenosha Company Asks to Abandon Heating System.**—The Wisconsin Gas & Electric Company has asked the Wisconsin Railroad Commission for permission to discontinue its public heating service in Kenosha. The hearing on the petition has been set for June 22. The reasons given for desiring to discontinue this service are high cost of coal and supplies and antiquated equipment in service on which no depreciation allowance had been provided by former operating company. The petition states that at existing rates the heating service has been operated at a loss for some time.

**Copper Production in Michigan.**—The production of copper in Michigan in 1916, as reported by the United States Geological Survey, Department of the Interior, was 273,692,525 pounds, valued at $67,328,361. The average price of copper per pound for 1916 was $0.246, compared with $0.175 in 1915. The smelter production, or the output of refined copper, in 1916 was 269,794,531 pounds, which represents an increase of 30,838,121 pounds over the smelter production for 1915. In 1916 the amount of "rock" milled was 12,364,114 short tons, which yielded 420,551,291 pounds of "mineral" and 268,279,876 pounds of copper. In 1915 the amount milled was 12,334,700 short tons, which yielded 400,178,132 pounds of "mineral" and 265,283,378 pounds of copper. The average recovery of refined copper per ton of "rock" milled in 1916 was 21.7 pounds, compared with 21.5 pounds in 1915.

**Electric Energy Sold Outside of City Subject to Franchise Tax.**—The city council, Wilmington, Del., as a result of special legal advice, has instructed the city authorities to proceed to collect a franchise tax from the Wilmington & Philadelphia Traction Company for electric energy generated at the local plant and sold outside of the city. The company has disputed the assessment, holding that it should not be compelled to defray a tax on such light and power service and foreign to local business. The counsel for the city says that as the contract for the sale of the electric energy was made in the city, it is immaterial whether such is used in or out of the city. In considering the phrase, "within the city of Wilmington," the legal opinion sets forth as follows: "This phrase means not only electricity used and sold within the limits of the city of Wilmington, but also includes electricity sold and used outside of the city, since the said electricity is manufactured and sold from the company's central station located in the city, and the contract of sale is made at the company's local office; if there be any doubt about the matter, the doubt should be resolved against the company." The company will undoubtedly appeal to the courts.

**British Aluminum Developments.**—A. W. Tait, chairman of the British Aluminum Company, referring to the enormous developments that have taken place in productive capacity for aluminum all over the world, particularly in the United States and in Norway, holds that it will not be very long after the cessation of hostilities before the commercial development and expansion in the uses of the metal will take up this increased supply and possibly call for further production. The company is pushing on with its new hydraulic works at Kinlochleven, in Scotland; the scheme will be partly ready for supply in the middle of this year and quite completed by the end of the year. Regulation works for increasing the available water supply for the company's works at Vigelands, Norway, are so far forward as to promise assistance this year. At the works in Switzerland no further construction can be proceeded with during the war. Mr. Tait says that after the war the motor-car industry will almost certainly manufacture their engines largely from aluminum because of its lightness and consequent saving in running costs and of its qualities of quick radiation of heat. The war-time production of light alloys and other experience will extend aluminum use for ordinary commercial purposes.

# Canton Substation for Receiving Power from Windsor Plant

## *A Substation with All High-Tension Equipment of the Outdoor Type, an Initial Capacity of 50,000 Kilovolt-Amperes, and the Largest Synchronous Condensers Ever Built—Distribution of Power at Canton*

By F. H. BERNHARD

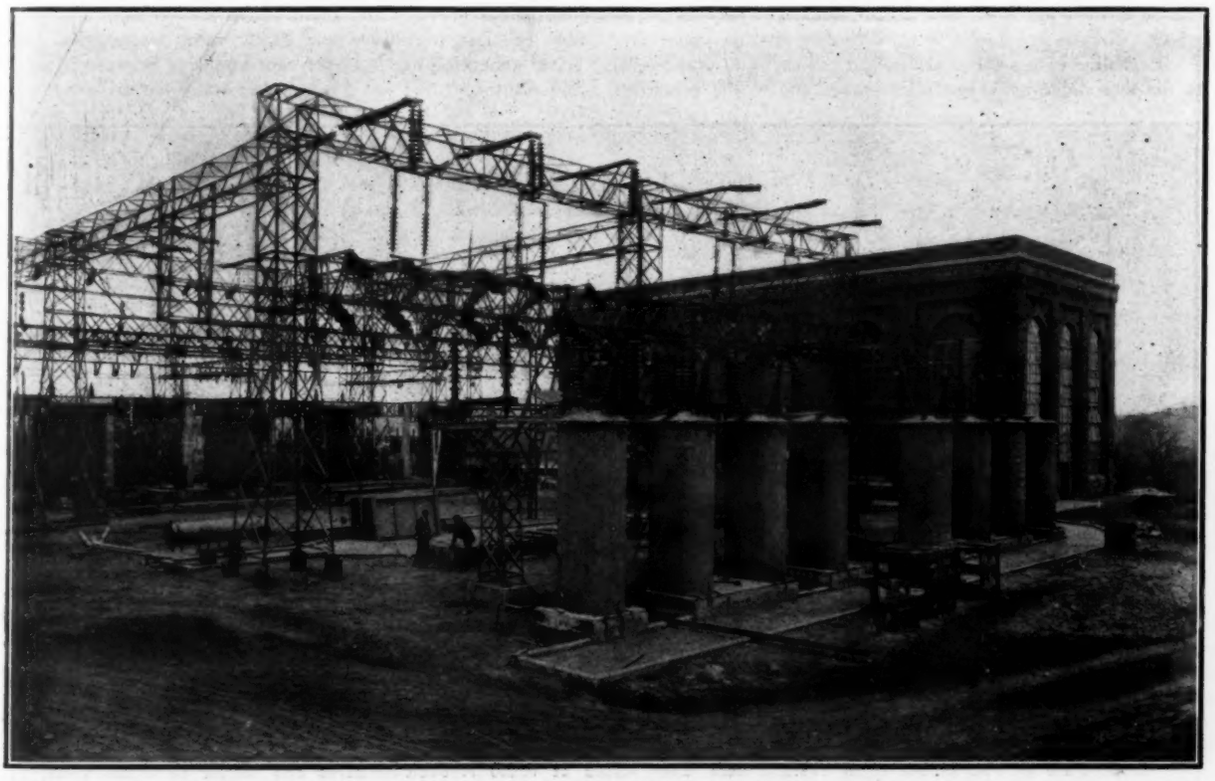
DEVELOPMENT of high-tension apparatus of the outdoor type has been so rapid in recent years that it is now entirely practicable to build transmission systems of the highest voltages with both sending and receiving equipment installed in the open air. Such equipment is as reliable as that used indoors and the installation as a whole is much more economical. Consequently newly built transmission systems now utilize weatherproof outdoor apparatus on a larger scale than ever.

Doubtless the most important outdoor installations of this type ever built, because of their unusual capacity and other exceptional characteristics, are those nearing completion in connection with the Windsor (W. Va.,) power project. These include two outdoor switching stations at the Windsor plant and the receiving substation at Canton, O. In articles in the two preceding issues there have been described the general features of the Windsor plant and the Windsor-Canton line. The present article will deal principally with the substation at the receiving end of this 130,000-volt line and also touch on how the power will be distributed in Canton.

### General Scheme of Substation Design.

The primary function of the substation at Canton is to transform the potential of the power received from the 55-mile line coming from Windsor to a secondary or local transmission pressure of 22,000 volts, at which it is to be sent to the present Canton central station and to some of the largest industrial power customers. All of the transformers for this purpose, together with the switches, buses, lightning arresters and other high-tension auxiliary equipment are of the weatherproof type and installed outdoors where there is abundant room for future extensions southward. On the north side of the substation property is a brick building for housing a group of synchronous condensers for power-factor and voltage regulation, the condenser auxiliary apparatus, the operating and metering switchboards, cooling-water circulating pumps, etc. There is also a separate oil house for the oil circulating pumps, filters and storage tanks.

In the initial installation there are five transformers, each of 10,000-kilovolt-ampere rating. When the substation is enlarged to take care of an additional incoming double-circuit line there will be 12 of these transformers in service with an extra unit in reserve, making a total working installation of 120,000-kilovolt-amperes in transformers. At present there are two synchronous condensers, each of 7500-kilovolt amperes; two additional machines of this type will be put in later, the plan being to have one of these condensers and a



**General View of 130-Kilovolt Switchyard and Condenser and Operating Building, Canton Substation—Aluminum-Cell Lightning Arresters in Right Foreground.**

bank of three transformers for each incoming transmission circuit. By means of auxiliary or transfer fuses these various elements can be interchanged.

The Canton substation is situated southeast of the city and just outside the city limits. It is near a creek and not far from the main line of the Wheeling & Lake Erie Railroad, from which a spur track leads directly into the substation building. The site covers several acres on the side of a hill, the building with its two basements being on the low side. This made it possible to reduce the necessary excavation for building foundations somewhat and permitted using the material graded from the high parts to fill in the low ones. In making the excavation a vein of coal was struck; this was used for fuel during construction work last winter.

In every feature of the entire design special consideration was given to providing such a selection and arrangement of apparatus as would give the highest possible reliability of service and maximum safety. At the same time the design facilitated construction of the entire substation and provided for speedy cutting out and replacement of any defective equipment in service. The arrangement is also such that extensions can be made to an almost unlimited extent without interruption to service. Although some of the illustrations give the idea of considerable complexity, the general layout is quite simple. The large amount of apparatus required for a substation of this exceptional capacity and the compactness of the general design are the features that at first give the impression of complexity.

### Equipment of the 130-Kilovolt Yard.

The outdoor portion of the station is in general arranged into two distinct sections, of which the eastern part is the 130-kilovolt switchyard and the western part the 22-kilovolt yard. Steel trusswork mounted on towers supports the overhead lines, buses, disconnecting switches, etc., at about 30 feet above ground. The oil switches, arresters and transformers set on concrete foundations rising to about two feet above ground level. The main structural part of each 130-kilovolt bay or complete circuit unit is 48 feet wide by about 100 feet long. Two of these bays are now completed; others will be erected south of these as additional 130-kilovolt transmission circuits are added to the Windsor-Canton line.

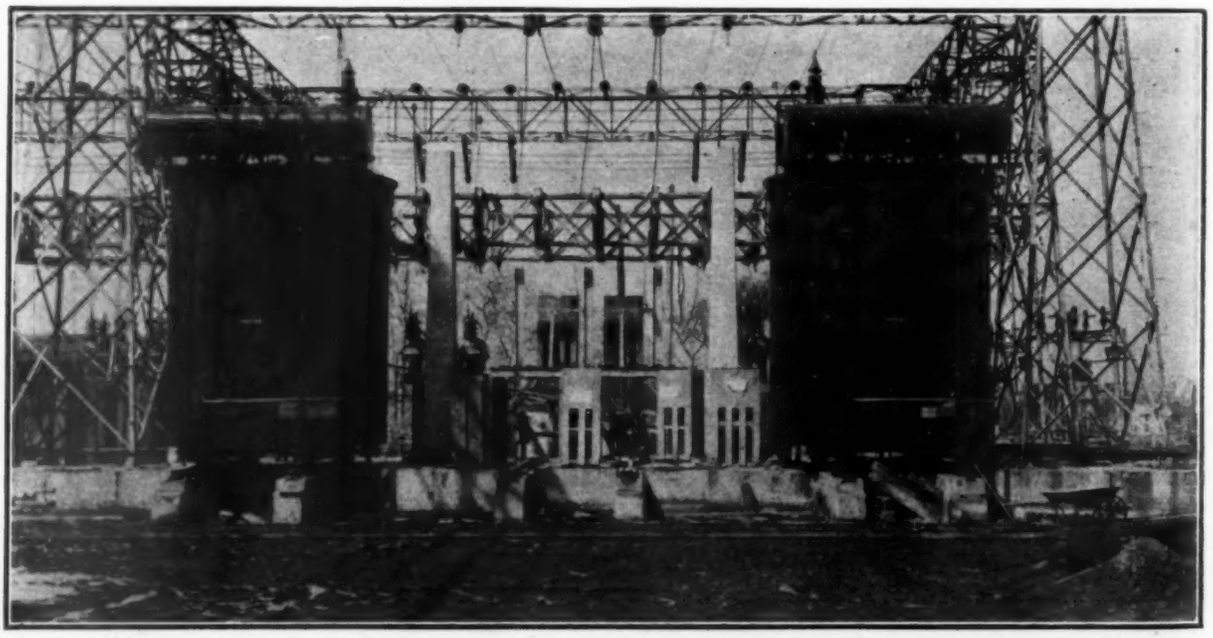
Each line enters the substation at the east end and passes to the line choke coils, line oil switches and to the primaries of the large transformers, all this direct path being in practically a straight line. Above the choke coils are connections, through disconnecting switches, to the aluminum-cell lightning arresters with the new sphere horn gaps. Means for completely grounding the line while repairs may be made on it are also provided. On each side of the line switches, which are of the K-22 oil type with bushing-type current transformer, are disconnecting switches.

By means of a set of buses the two present incoming lines may be connected in parallel through bus oil switches tapped in between the line switches and the main transformers; these buses also permit the use of either bank of transformers. It is expected to install later a set of auxiliary or transfer buses so as to make still more interchangeable the use of any bank of transformers with any line. The connections to this second bus will be made by means of bus-selector disconnecting switches. The direct line from the line oil switches to the main transformers is carried above the steel structural work and passes through special type LG-19 disconnecting switches above the transformers.

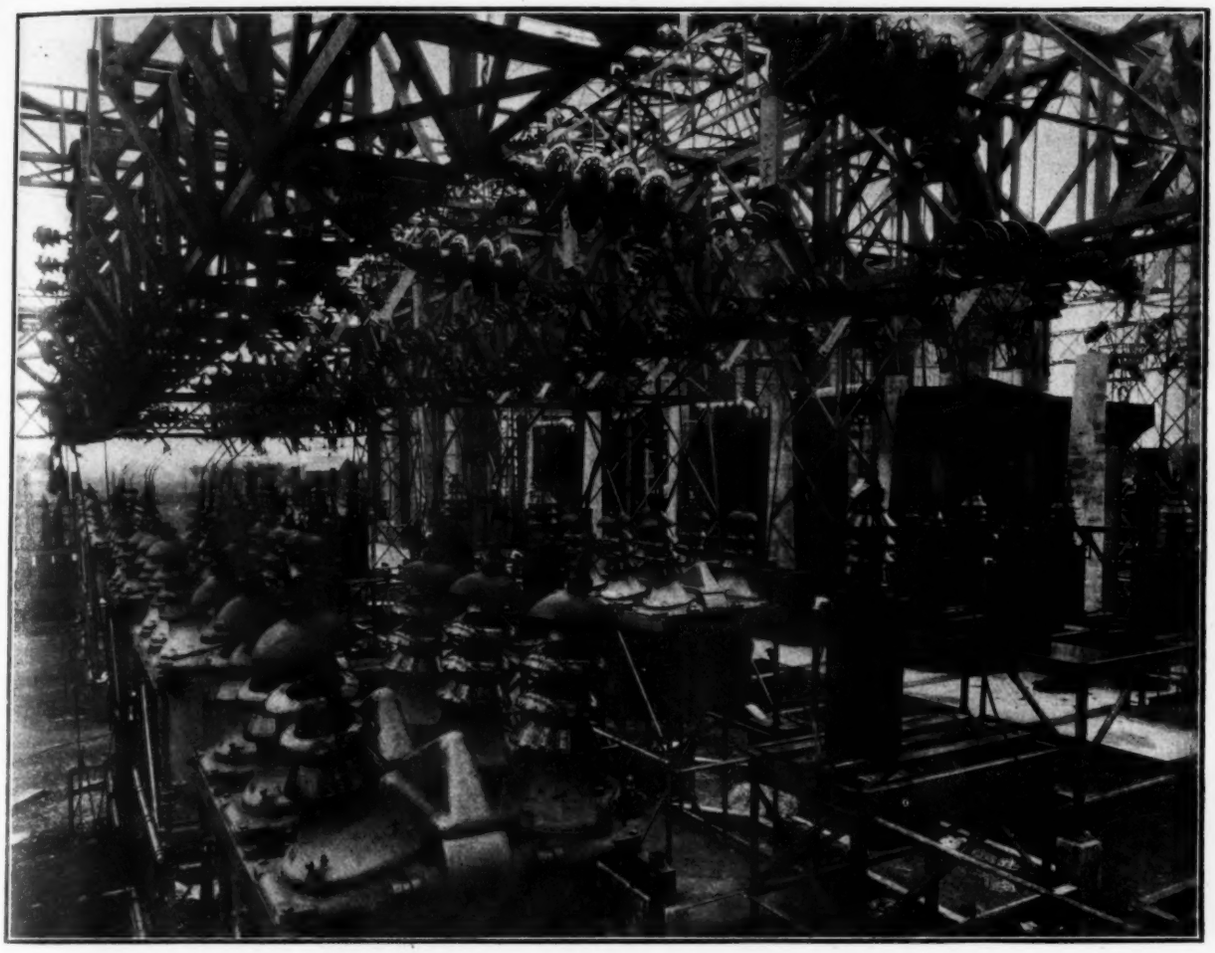
### The Main Transformers.

A good idea of the size of the main transformers can be gained from the illustration showing two of these units. They weigh 50 tons each and are of the oil-insulated, water-cooled type. They are rated for a continuous capacity of 10,000-kilovolt-amperes and will not exceed an operating temperature of 176 degrees Fahrenheit when supplied with 37.5 gallons of water at a temperature of 77 degrees. The five transformers now installed are connected in two banks, one bank of three in closed delta and the other of two in open delta.

A special arrangement of windings is provided for the transformers. The primaries are sectionalized so that when in series (as normally) they can be connected across 130,000 volts, when in parallel they can be fed at 65,000 volts. The main secondaries likewise are sectionalized for operation at 24,000 or 12,000 volts. An entirely distinct secondary winding is provided for supplying 6600 volts for the synchronous condensers and for miscellaneous power about the substation. The actual primary and main secondary voltages will probably be close to 120,000 and 22,000 volts, respectively, there being something under 10 per cent line drop between Windsor and Canton.



**Close View of Two of the Main Transformers, Each Rated at 10,000 Kilovolt-Amperes and 130,000 to 24,000 Volts.**



General View of the 22-Kilovolt Switchyard, Showing Feeder a nd Bus Oil Switches, Overhead Buses, One Temporary and Two of the Permanent Transformers.

Outside of the 6600-volt leads the connections to and from the transformers are entirely in the open air. The 6600-volt circuits are led down the concrete columns adjoining the secondary side and pass through a concrete-lined tunnel to the building. In this are also run the conduits for the oil-switch control circuits, connections from current and potential transformers, etc. In an adjoining concrete tunnel is run the piping for water-cooling the transformers, also oil piping between the oil house and transformers, oil switches and lightning arresters. The walls of these tunnels serve as part of the foundations for the transformers below which they run, thus making very direct pipe and cable connections and economizing in concrete work.

Each transformer is mounted on a large wheeled base resting on rails. At right angles to these and running along the east side of all the transformers and directly into the building is a track on which can be run a special transfer truck. The transformer can be rolled onto this and hauled into the building, if occasion should require its dismantling or thorough inspection under cover. This arrangement was also used in placing the transformers into position, for which purpose power for haulage was provided through a set of pulley blocks connected by cables with the traveling crane in the building. This permitted installation in quick time and with a minimum of labor, considering the great weight of these transformers. The same arrangement will be used to roll the spare transformer into the place of any disabled unit.

Similar, though smaller trucks, with flat wheels were used for hauling into place all of the oil switches and lightning arresters and other heavy pieces, concrete or gravel walks being used as runways and the apparatus moved into place on steel channels.

### The 22-Kilovolt Yard.

In the 22-kilovolt yard there have been completed three bays, each 48 by 40 feet in area. Each bay accommodates two outgoing feeders, two sets of buses, four or five oil switches, besides numerous disconnecting switches, instrument transformers, etc. The smaller clearances required for this voltage permit a much greater compactness than is possible in the 130-kilovolt yard. The 22-kilovolt secondary delta from each main transformer bank is connected through choke coils to two bus-selecting oil switches of the KO-26 type, by means of which it can feed either set of buses. Bus-sectionalizing oil switches will be installed in each bus later, provision having been made for these already. A bus-tie oil switch permits connecting both sets of buses together.

Each outgoing feeder contains an oil feeder switch governed by an inverse-time-limit relay. This switch or circuit-breaker is connected through two bus-selector disconnecting switches with each bus, so that the feeder can be supplied from either the No. 1 or No. 2 buses. An auxiliary connection is also made direct from the feeder through a type LG-19 disconnecting switch to bus No. 1; the object of this is to provide against trouble in the feeder switch. In case of such trouble all the other feeders are connected to bus No. 2, as are the supplying transformer deltas; the feeder with the defective switch is then connected through the LG-19 switch with bus No. 1, which is fed from bus No. 2 through the bus oil tie switch, which furnishes the protection to the

feeder that it normally would secure through its own oil circuit-breaker. This is an instance of the care with which every possible source of trouble has been guarded against. Each oil switch, arrester and breaker throughout the yard has a disconnecting switch connected on each side for isolation during repairs.

At the north end of the 22-kilovolt buses there are connected aluminum-cell lightning arresters with sphere horn gaps. These protect the entire 22-kilovolt yard from lightning or high-potential surges. At the south end of the yard is where extensions will be made to accommodate future feeders required by the growth of the Canton load.

### General Arrangement of the Substation Building.

The principal uses of the substation building have already been referred to. The outdoor switchyards provide for the primary electrical functions of the substation so that a building would be required only to house the metering and control equipments. However, the nature of the Canton demand being principally power load, and especially induction motors, there would be a relatively poor power-factor on the entire transmission system. To remedy this and thereby at the same time increase the carrying capacity and improve the voltage regulation of the lines, it was deemed desirable to install a synchronous condenser connected to each transformer bank. The installation of these condensers of course increased the size of the building required, but this had other advantages that will be apparent presently.

Aside from the main floor where the condensers are installed there are two higher floors and two basements. The railroad track previously referred to leads into the sub-basement, in which there is also a coal-storage room and heating plant for the building, whose inside dimensions are 108 by 45 feet 8.5 inches. The headroom above the track extends through the upper basement, where at one side there is a large storeroom and at the other, locker and wash rooms for the operators, and tanks and auxiliaries for the water-circulating system for the transformers connected to the pipe tunnel. Above this tank room is the pump room on the main floor, where there are circulating pumps; one of these is arranged for the normal cold-water circulation of the transformers, the warm water from which is returned to a tank. In case any transformers are idle during cold weather, warm water is circulated through their ordinary cooling coils in order to keep them from sweating and thereby deteriorating the dielectric value of their oil; a separate pump is used for this purpose.

A hatchway is located in the main floor directly above the railroad track. Through this material was unloaded from the cars and raised to the main floor. To facilitate power hoisting a 50-ton electric traveling crane was installed on its runway before the walls and roof of the building were completed. This crane runs the length of the building over the condensers, the hatchway just referred to and the track leading from the main floor into the switchyard. The main transformers and all heavy parts were quickly unloaded from the cars in this way and either stored in the building until needed or hauled directly to their proper place as already described on a preceding page, all of the power being obtained through the crane.

The two condensers already installed are in the northeast section of the main floor. Additional units will be placed in an eastern extension of the building to be erected when needed. These machines are each rated at 7500-kilovolt-amperes, being the largest synchronous condensers ever built. In design they are very large and apparently idle-running synchronous motors with direct-connected field exciters on one end of the shaft; each of these exciters is a 50-kilowatt machine. There is also a separate 50-kilowatt exciter for emergency use, which is driven by a 220-volt three-phase induction motor.

The stators of the condensers are wound for 6600 volts which is obtained from special secondary windings on the main transformers as already explained in the description of the latter. The 6600-volt circuit from each transformer bank is connected either directly to its condenser or to a 6600-volt bus, bus-tie oil switches of the H 3 type being used. From this bus there is connection through another oil switch and a set of three starting compensators with the starting bus. In starting the condenser it is first connected by means of a K 12 oil switch to the starting bus which supplies reduced

**Corner of Substation Building with Railroad Track Running into Basement. End of 22-Kilovolt Yard Appears Near Middle and Oil House at Right.**

voltage. When practically up to speed the starting oil switch is opened and its electrically interlocked mate, the running switch, instantly closed, thus throwing the full 6600 volts on the machine. Regulation of the condensers is entirely automatic, within adjustable limits, being governed by Tirrill regulators in the direct-current field circuits, the regulators being in turn governed by line conditions.

On the condenser floor are also found the starting compensators just referred to, the 6600-volt bus structure, and a set of station-service transformers connected to the 6600-volt bus. There are four of these 50-kilovolt-ampere transformers, one being a spare unit; they furnish 110 and 220-volt service for lighting the station, and for power for the various pump, crane and other motors about the premises. A small motor-generator set is provided for charging a storage battery that supplies 110-volt direct current for operating the oil switches and emergency lighting.

On the main portion of the second floor is the operating room. It has a glass partition to command a good view of the condensers below and large windows on the south permit seeing every part of the switchyard. The main operating board is of the benchboard type with a one-line diagram of all circuits. All of the control of oil switches, etc., is obtained through low-voltage control circuits so that there is no potential higher than 110 volts on this board. Red and green pilot lamps indicate closed and open positions of the switches in accordance with best operating practice. Separate boards are provided for the station service circuits, for the outgoing feeders and for the recording and integrating wattmeters. Indicating instruments are mounted above the operating panels. In an adjoining room are the oil switches for the 6600-volt buses, condensers, station transformers, etc., except the starting switches which are near the compensators on the main floor. On the third floor is the substation office and the storage-battery room.

The oil house is a small one-story building to the west of the main building. Here are installed three motor-driven oil pumps and two oil filters. The oil piping system connects from the oil house to all of the large transformers, oil

switches and lightning arresters, one pipe being for carrying the dirty oil to the oil house and another pipe for returning clean, filtered oil. Three storage tanks are arranged so that one end of each projects into the oil house while the body extends outside. Each tank has two compartments, one for dirty and the other for clean oil. The largest tank, having a capacity of 16,000 gallons, is for the transformer oil. Each of the two smaller tanks has a capacity of 7500 gallons; one is for the oil for oil switches and the other for oil used in the lightning arresters. Before any unit is removed for repairs its oil is drained off and stored in the dirty-oil compartment, from which it is forced at leisure through the filter and into the clean compartment.

Cooling water for the transformers is obtained from wells, of which three have been sunk. Only one of these is flowing, however. The probability is that another well will be sunk. Water can also be obtained through a city connection in emergencies. Provision may be made in the future for a cooling pond to conserve the water supply.

Before closing the description of the substation proper, mention must be made of the interesting way in which temporary power transmission was obtained from the Wheeling district over the Windsor-Canton line in order to relieve the threatened power shortage at Canton last winter caused by the extremely rapid increase of load to practically beyond the capacity of the Canton generating station. This made it almost imperative to put the transmission line into service before the substation was completed and ready to receive the power by the equipment to be permanently installed. Much of this equipment would not be available for several months, especially the large transformers. Consequently every effort was redoubled to complete one circuit of the line and make part of the substation ready for temporary service. A bank of four indoor-type transformers rated at 1650-kilovolt-amperes and 66,000/11,000 volts was fortunately secured from South Carolina, shipped to Canton and installed under temporary cover. To do this required not only special arrangements at the substation, but the finest kind of team work by the entire construction organization. It was successfully accomplished, however, and power has been received at Canton

View in Operating Room, Showing Feeder Board at Left, Station-Service Board in Middle, and Main Operating Benchboard at Right.

from the Wheeling district for many months, as was described in the two preceding articles of this series.

POWER DISTRIBUTION IN CANTON.

The feeders from this temporary transformer installation operate at 11,000 volts and connect to a receiving substation adjoining the Canton generating plant and to outdoor-type substations installed for the principal industrial power customers of the Central Power Company.

When the large substation at Canton is placed into normal operation, receiving power from the new Windsor plant, these feeders will all be raised to 22,000 volts. Arrangements are now being made to adapt the individual receiving substations for this double voltage and the change-over will doubtless be made without any trouble.

The feeders run as overhead pole lines with pin-type insulators. At first there will be six outgoing 22,000-volt feeders, of which two connect with the Canton generating station, where the voltage is stepped down for general distribution at 2300 volts over the distributing network of the central-station company. During about eight months of the year the generating station will be operated to such an extent as will supply the necessary exhaust steam needed for the central heating system maintained in the business district by the company. The remaining load will be supplied from the Windsor plant. During the four months or so when there is no demand for heat, the station will be shut down except for possible standby service. This program will enable operation of the Canton plant and, in fact, of the entire Windsor-Canton power supply at maximum economy.

Four feeders will at first supply the heavy power users at Canton direct from the large new substation. One steel plant has already contracted for about 19,000 kilowatts, though, of course, it is now supplied only about half this. Another large manufacturing plant with four electric furnaces and many motors takes about 10,000 kilowatts. There are several large power users, for whom direct power supply is advantageous. As far as possible, these special power feeders will be so run as to give two lines of supply on the ring system. Additional power feeders, both to the Canton central station and to the largest power users, will be run as more and more power is available from Windsor with the placing in operation of each generating unit on completion.

The efficient design and construction of the Canton substation are due to combined efforts of two strong organizations. The design was prepared by the Engineering Department of the Electric Bond & Share Company. Construction is in general charge of F. W. Abbot, vice-president and construction manager of the American Gas & Electric Company. The construction organization actively carrying on the work is as follows: Frank Howard, general superintendent; F. A. Pearson, superintendent of construction; R. E. Behnke, resident engineer for the designers; P. A. Baker, engineer of construction for the General Electric Company, which is furnishing all of the electrical apparatus installed.

## Boiler Deterioration Due to Sodium Hydroxide in the Feed Water.

In certain districts where feed water for boilers contains sodium hydroxide many boiler troubles have appeared which have given no little concern to boiler users and makers. Such water is found in the central eastern part of Illinois, in the Fox River valley in the northern part of the same state, and in portions of other states.

The Engineering Experiment Station of the University of Illinois has just completed an investigation of this source of boiler distress, and the results are published in Bulletin 94 by S. W. Parr.

It was noted that boilers using feed water containing sodium hydroxide often developed fine cracks radiating from rivet holes or extending from hole to hole. The experiments showed that the effect upon the metal is to cause brittleness which makes it less capable of withstanding steam pressure and temperature changes. Among the remedies suggested is the addition of a salt having properties which cause it to react with the alkali and yield a harmless product.

# The Seattle Hydroelectric Plant

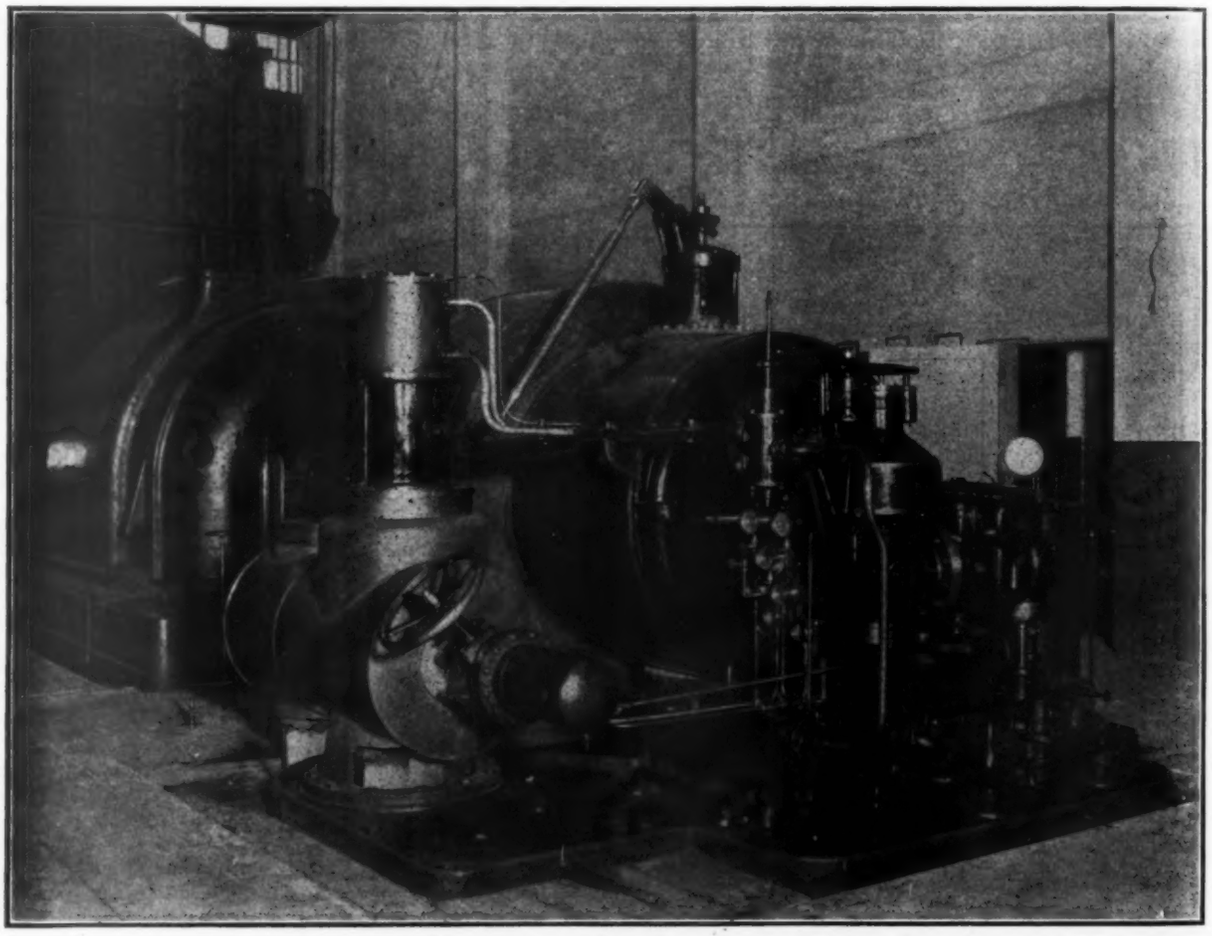
## *Interesting Features of Present Plant Serving City of Seattle, Wash., and Details of New Construction Work Which is to be Undertaken*

By W. A. SCOTT

THE Board of Public Works, Seattle, Wash., is beginning extensions to the city's municipal light and power system which will result in more than doubling its capacity within the next two years. This is one of the largest municipal systems in America, and one which has grown at an ever increasing rate since it was established in 1905. One of the new extensions, work on which has commenced, consists of the installation of a 10,000-kilovolt-ampere steam-generating unit at the Lake Union steam-electric station within the city limits. This is to supplement and reinforce the original Lake Union plant, completed in 1914, having a rated capacity of 9375 kilovolt-amperes. Hence, the Lake Union steam generating plant will have a capacity of 19,375 kilovolt-amperes when the new unit shall have been completed by July, 1918. The Lake Union first unit, which has been in service since 1914, designed as an auxiliary to the city's hydro-electric plants, has four oil-fired Stirling boilers of 823-horsepower each; a 13,000-horsepower Allis-Chalmers steam turbine, which drives a 7500-kilowatt generator, having an overload capacity of 9375 kilowatts. It is proposed to install four additional boilers of similar capacities. The transformers in use here raise the voltage to 15,000 for distribution and for transmission to the Seventh Avenue substation. The Lake Union hydroelectric plant, of 1500-kilowatts capacity, is another auxiliary to the main system. This consists of a 1500-kilowatt generator, driven by a Pelton-Francis turbine, operating on waste water from the city's Volunteer Park reservoir. The plant is utilized as a ready-aid in case of some accident or emergency.

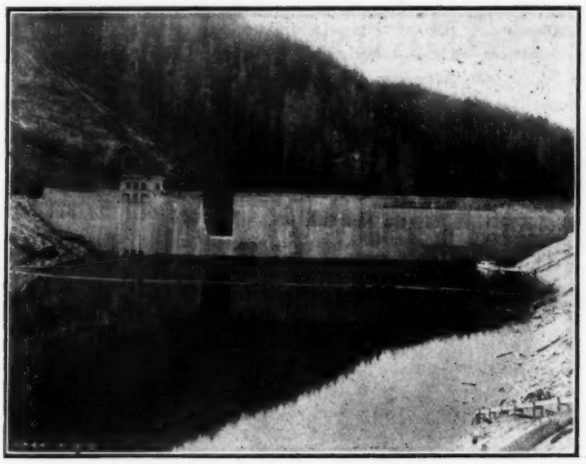
### New 25,000-Kilowatt Plant.

The most important work outlined as to extensions above mentioned consists of the construction of a new hydroelectric plant, capable of delivering 25,000 kilowatts, in the city of Seattle. General specifications for a complete plant of this capacity were issued May 18, by the Board of Public Works, under Ordinance No. 36,852, and inviting bids thereon until July 20, 1917. The estimated cost of the proposed plant is declared to be approximately $3,000,000, a bond issue of that amount having been authorized. The specifications do not contain plans for a plant at any designated site, as several locations within practicable transmission distance of the city



Steam Turbogenerator in Lake Union Auxiliary Plant, Seattle, Wash.

Cedar River Generating Station—Seattle System.



Cedar River Masonry Dam—Seattle System.

are available; and bidders are asked to submit plans applicable to the sites they propose for adoption, together with plans and unit prices for every phase of a complete plant, including dam construction, pipe-lines, penstocks, forebays, generating plant, transmission lines, transformers and accessories. They require the bidder to submit maps and complete data as to available water supply in a given watershed and the capacity of the proposed storage basin. It is specified that there shall be two generating units, each unit having its own individual penstock, starting at the forebay or storage tank.

The city's principal hydroelectric plant in service is situated at Cedar Falls, about 40 miles from Seattle. The power house at this point contains four generating units—two of 4000 kilowatts each, driven by Francis turbines equal to 8000 horsepower, and two of 1250 kilowatts each, driven by Pelton wheels, giving a total of about 10,500 kilowatts, which are now being delivered to the city over two transmission lines.

### Details of Present Plant.

The first one of these lines, built in 1904, is of No. 2 copper wire, strung on 35-foot and 40-foot cedar poles, spaced about 130 feet; the second line, built in 1908, is of No. 0000 copper, on 55-foot and 60-foot poles, with a spacing of 450 feet. The storage basin for this system is Cedar Lake, having a surface area of 1.91 square miles at its original elevation of 1530 feet. The initial power development here was the construction of a rock-filled timber crib dam, 250 feet in length, in 1902, by which the lake was raised about 13 feet. In 1909 the dam spillway was raised five feet, bringing the crest up to elevation 1547.94; and at this altitude the surface of the lake has an area of 2.60 square miles, giving an available water storage of 976,000,000 cubic feet. The pipe line extending from the rock-filled dam to the generating plant has a length of 16,816 feet. The elevation of waterwheel shafts is 946 feet above sea-level, giving a static head of 600 feet from the crest of the dam. There are two penstocks, designated No. 1 and No. 2. No. 1, laid in 1904, is constructed of wood-stave pipe, with wrought-iron bands, and has an inside diameter of 49 inches. At the lower end it connects with 1008 feet of 48-inch steel dam.

There are two penstocks, designated No. 1 and No. 2. inside diameter of 67.75 inches, and similarly banded. This pipe has a length of 15,865 feet to a place where it connects with two 48-inch steel penstocks, each 951 feet in length. At 3600 feet on this line above the power house are two steel standpipes, 65 feet and 70 feet high respectively. In 1915 a new intake for each penstock was put in at the dam. This consisted of a steel pipe connecting to each penstock just below the dam and extending up beneath the dam, into the lake, ending in a horizontal steel cylinder of same size as the pipe, and this is perforated with 1.5-inch holes designed to give a maximum velocity through the holes of 2.5 feet per second. By means of these intakes the lake may be drawn down at least two feet lower than before. The larger pipe contains a 72-inch gate valve just below the dam, and the smaller pipe a 36-inch valve. The larger pipe has five steel elbows of 15-foot radius, and varying from 45 to 90 degrees, used where it was necessary in making too short a turn for a wood pipe. The sharpest curve in the wood pipe line has a radius of 320 feet and the highest head under which it works is 310 feet.

### Features of Cedar River Dam.

This Cedar River storage basin, it was ascertained, was capable of an ultimate development of 40,000 kilowatts. This precipitous, heavily timbered watershed has an area of about 78 square miles, and receives a precipitation of 112 inches per annum. It is the source of Seattle's water supply. In order to be able to utilize this Cedar river drainage for power purposes, the Cedar River masonry dam was constructed during 1914-15 to hold the flood waters. The site of the dam is 7000 feet down stream from the rock-filled timber dam. The structure is of concrete, founded upon solid rock. It is 961 feet long, 215 feet high, and contains 112,500 cubic yards of masonry. A tunnel through rock leads from the upper face of the dam around the south end, for a distance of 1500 feet, and there divides into three branches, each of which to connect with a 66-inch steel penstock. When the dam was completed in 1915, and the water turned into the storage basin above it, a loss by percolation through the north bank of the river, above the dam, was found to be so great that it was deemed best not to use the reservoir until the porous bank of the basin could be sealed. To accomplish this, portions of the basin will be excavated out, and the banks will be smoothed off, and a lining of clay and silt applied by sluicing. The cost of sealing the reservoir is estimated at $425,000 to $1,225,000. The work will soon be in progress.

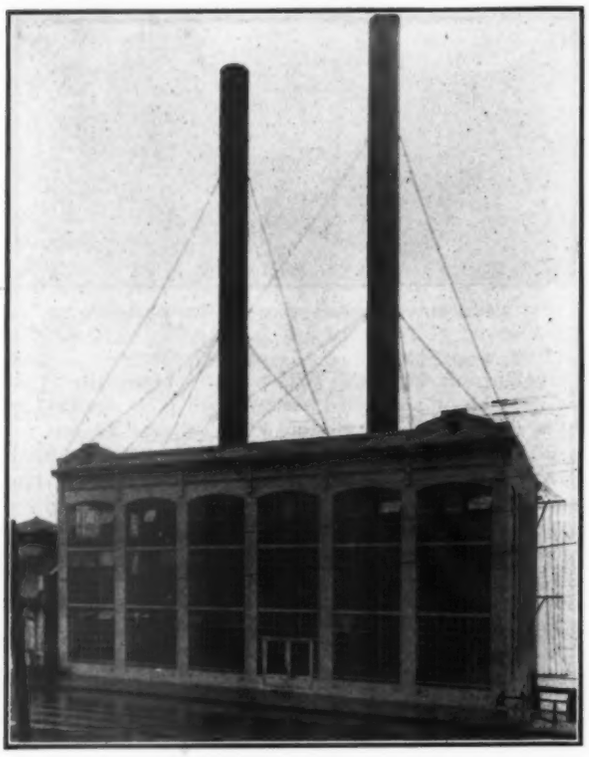
This situation does not interfere with the generating units in the power house, which are operated from the penstocks that derive water from Cedar Lake, above the timber crib dam. But as soon as the greater reservoir, sustained by the big masonry dam, is successfully sealed, the necessary equipment will be installed at the Cedar Falls generating station to raise its capacity to 40,000 kilowatts.

### Present Power Demands.

The demands for power for industrial and manufacturing purposes in Seattle are such as to tax not only the

capacities of municipal plants but plants of competitive private companies. The municipal lighting department has 43,000 accounts on its books, and the gross receipts for 1916 amounted to $1,200,000, according to recent returns made to the City Council.

The designing, construction, engineering and operating



East Lake Avenue Generating Station at Seattle, Wash.

in connection with the work noted herein were, from their inception up to 1911, under the electrical engineering direction of J. D. Ross, now superintendent of lighting.

## Right of Way for Electrical Lines—A British After-the-War Problem.

By A. H. Bridge.

The Institution of Electrical Engineers devoted a meeting early in April in London to what in connection with the developing electric power situation in England is a very important matter, namely, that of wayleaves for carrying overhead and underground cables across private property. For very many years it has been recognized that difficulties imposed by legislation would be increasingly experienced as the use of overhead mains became more general. Twelve years ago the matter was placed before the Institution by G. L. Addenbrooke and since then the need for legislative facilities has become more and more insistent. W. C. Vernier, who reopened the question in April, remarked that at the date of the earlier paper electric power supply as we know it today was in its infancy. It is true that between 1,000 and 2,000 route miles of overhead electric mains have been erected under the prevailing difficult conditions, but Mr. Vernier holds that the time has come to consider seriously whether the important services which public suppliers of electric power, light, and heat must continue to afford, and in an increasing measure, to British industries, manufacturers, railways, and the practically untouched field of agriculture, in the strenuous and difficult times which will follow the war, do not call for prompt legislative assistance in removing certain difficulties that at present hamper their fullest development. He believes that in the seriously accentuated need for efficiency and economy of the future electrical services will be sought for to an unprecedented extent.

Mr. Vernier's paper was closely concerned with the securing, to the fullest possible extent, of the advantage of the economies in capital cost which can be effected by the use of overhead wires for interconnecting, transmitting and distributing mains across open country, and the no less important economies which can be obtained by laying underground mains wholly or partly on private property whenever the use of such mains is found desirable. His remarks did not necessarily apply to overhead wires in towns and villages, these standing in a somewhat different category. On 20,000-volt mains the saving in capital cost which can be effected over an equal length of route by the use of overhead wires as against the use of underground cables is in the neighborhood of 50 per cent, excluding the cost of wayleaves in each case. At higher voltages it is yet greater; while by using cross-country routes for underground mains, instead of keeping strictly to public roads, a saving in capital cost of 30 per cent is not uncommon on routes of several miles, and even more on shorter lengths, as the result of shortened routes and cheaper reinstatement of the ground.

### Higher Voltages Necessary.

Although the Board of Trade is willing to allow extra-high-pressure overhead lines on public roads, subject to strict requirements regarding public safety, practical considerations usually render this, if not quite impracticable, at least extremely undesirable, and therefore all such lines must ordinarily be placed on private property. The probability has to be faced that in the near future much higher transmission pressures will be employed, and this cannot in the present state of the art be satisfactorily dealt with, if at all, by underground cables. Mr. Vernier considered the difficulties in the use of overhead wires for extra-high-pressure transmission under the two heads of "Consents" and "Wayleaves." He reprinted particulars of what he described as the admirable legislative provisions afforded for the erection of overhead and underground mains on private property in Italy and Switzerland. It is held that the drastic powers exercised in England by the state during the war under the Defense of the Realm Acts will have accustomed everyone, legislature and public alike, to the idea of state interference with private rights in anything that concerns the public interest, and the vital importance of rendering the nation as self-supporting as possible in the future, both industrially and in regard to agriculture, will call for more intelligent state aid and oversight than in the past, and in many previously neglected directions. No new legislation of this nature can be considered by Parliament during the period of the war and for some time after, but Mr. Vernier suggested that the council of the Institution of Electrical Engineers should formulate proposals and consider without delay the best means of securing their adoption.

### Radical Changes Necessary.

It is regarded as inconceivable that the present procedure controlling the acquisition of land in England for general public purposes, including electric power supply, can for long remain unchanged after the war, and Mr. Vernier advanced a number of propositions for procedure to secure the desired end failing agreement between electricity supply authority, landowner and occupier concerning wayleaves for electric mains on private property. The success or failure of any proposals such as these which the Institution of Electrical Engineers has been discussing would obviously depend upon the degree of "public utility" which might be attached by the government department concerned to the various kinds of electrical services.

# Problems of Electric-Range Manufacture

## *A Concise Statement of the Conditions of Manufacture and Distribution Which Are Responsible for the Apparently High Prices*

By GEORGE H. HUGHES

*President, Hughes Electric Heating Company.*

THE electric range is not a metal table or a metal box on legs, neither was it the manufacture of other kinds of stoves that suggested electric stove manufacture. The suggestion came from an entirely different source. It was a chemist who started it all, a Mr. Marsh, who, ten or twelve years ago, while searching in his laboratory for proper materials for automobile bearings, discovered that a combination of nickel and chromium had wonderful properties—that it was practically non-corrosive and non-oxidizable under all conditions of service, and that it had a melting temperature of approximately 2700 degrees. But above all things else, it offered a very high resistance to the passage of the electric current. In other words, this nickel-chrome combination offered a practical solution to the question of how to turn electricity into heat.

Mr. Marsh proceeded to take out patents on his invention, and while the question of the validity of these patents was undetermined for some years, yet the courts, about two years ago, ruled that they are valid. After this decision was made the manufacturers of all heating devices using nickel-chromium were licensed, and they pay a heavy royalty for the use of this material. In addition to this royalty the owners of the patents fix prices and discounts of all manufacturers, so that today all domestic electric heating appliances, as well as electric ranges, are operating under this license. There are seven unlimited licensees—and by "unlimited licensees," I mean licensees who are privileged to manufacture anything in the electric heating line using nickel-chromium, and comprising the leading companies in the electric heating line. All other companies operate under limited licenses with certain restrictions.

So this is the first condition controlling the successful manufacture of electric ranges. They are all subject to this one patent granted to the inventor of the nickel-chrome resistance. The owners of this patent have set certain standards and imposed certain conditions on the manufacture of all appliances using this material. Therefore, during the several years that this patent is yet to run, or until a better material than nickel and chromium is discovered, the owners of the Marsh patent will be able to set certain conditions on electric-range manufacture.

### Importance of the Burner.

The next limiting factor is the burner. The burner in an electric range is equivalent to the burner in a gas or gasoline stove. It is the part of the stove the business of which is to produce the heat in the place where wanted, to the degree wanted, and without waste.

I have said that the burner is a limiting factor in stove manufacture. By this I mean that, after the prospective manufacturer of electric ranges secures one of the licenses under the Marsh patent, he still is confronted with the problem of producing a good heating unit, or he will fail in this field.

I believe that every electric-range manufacturer will tell you that his present burner is the result of years of costly experimenting. I know that the Hughes burner is the result of such a process. One thing that has made it costly is the fact that the experiments were in a totally new field. Here mechanical skill and experience has availed little. Electric heat has brought with it new problems, and experimenters in this field have had to learn a world of new facts.

We believe that we have made considerable advances in the perfecting of the heating unit, and we have covered our advances with basic patents. Of course this does not mean that everything has been done with the heat unit that can possibly be done. There are many electrical experimenters at work in this field. However, if a young man should ask my advice as to what part of the electric range business it would be to his best advantage to specialize on, I would not suggest that he experiment to bring out a new heating unit. Some of the present heating units are doing such good work that I believe further experimenting right now would be futile.

I have spoken of the Marsh patents and the patented heat units as factors which definitely condition or limit the manufacture of successful electric ranges. In other words, if you would produce a successful electric range today, you must first secure a license, and you must next obtain the right, either by contract or by years of experimenting, to manufacture a successful heating unit.

### Reasons for High Costs.

Another limiting factor is the comparatively high cost of producing an electric range. This cost is due to the following items:

First, the nickel-chrome wire used in the heating units is expensive, and in addition to this is the royalty paid for its use.

Second, the electrical equipment that goes into each stove is a large item of cost.

Third, the other costs of electric range manufacture are high, and probably never will be lowered enough to even approach that of fuel stoves, even after the output has greatly increased over that of the present day. This is due to the fact that there is so much hand work and expensive material, aside from steel and castings. Labor expense also is high, as it requires much more skilled and higher-priced labor to assemble an electric range than a fuel range.

In seeking to discuss the road along which electric-range progress seems bound to travel, I have named three conditions—the Marsh patents, which tend to make for exclusiveness of manufacture; the particular needs of the heating unit, which means that only brains, plus hard work, will win success here; and the high cost of production, which means that the market for electric ranges is bound to be more limited than that for fuel ranges.

I wish to point out a fourth limiting condition. This is the attitude of the public toward electric cooking and electric ranges.

### Attitude of the Public.

Manufacturers of fuel ranges are able to talk the English language to American stove users, while electric-range manufacturers are talking Greek to them. The former have a public already thoroughly educated to the value and the use of fuel ranges. The average American family would no more think of going without a fuel stove than it would think of going without clothes. A fuel stove is a national American habit, like eating pie, and the fuel-stove manufacturers have the great public with them.

The electric manufacturers are seeking to break in and make a few of these Americans change this habit. We are reformers. But most of the public do not as yet understand

our language. What are volts and watts and amperes? What is a short-circuit? What is a fuse? A woman has to understand some of these things in order to do first-class work with an electric range. We believe that eventually thousands of women will learn these necessary electrical facts, but it will take a few years.

It will take years before many homes that really ought to have electric cooking will install it. As the world grows and develops, we expect to see more people taking up electric cookery every year, but it is going to take years of constant education to do this.

I have named four factors that are guiding the direction of the electric range business. I now introduce the fifth limiting and controlling factor. This is the central station, with its various problems.

### The Central-Station Company.

The manufacturers of coal, gasoline, and kerosene ranges have a market practically unlimited by questions of fuel supply. The manufacturers of gas ranges and of electric ranges have markets limited to localities equipped with gas mains and electric current.

Therefore, we can say, first of all, that electric cooking can go no farther than the wires go. Electric stoves cannot be sold everywhere. There are millions of homes that cannot possibly have them for years.

In the manufacture and sale of electric ranges and promoting this field of endeavor, the chief obstacle that we have had to overcome was the opposition of the central-station managers throughout the land. Electric current differs from any other manufactured commodity in that it must be manufactured as it is used. It cannot be manufactured during the daytime or at off-peak hours economically and then stored until night when the heaviest load is on, as is the case with gas, but the power plant must be of sufficient capacity to take care of the peak or maximum demand. This occurs usually in the month of November or December, with most power companies, and between five and six o'clock in the afternoon. So that the entire central-station investment is figured from this peak point. Their investment in transformers, pole lines, machinery and equipment that goes to make up an electric light plant depends entirely upon this maximum demand, and their opposition to the electric range has been based on the theory that with the low rate that was necessary to run the electric range and compete with fuel, that the maximum demand was too great and that they were therefore operating ranges at a loss instead of a profit. In many cases the companies have objected to making additional investment necessary to take care of this class of load due to financial and other reasons.

Happily, we believe today that a majority of the central-station managers have been won over to the idea that the electric range is a desirable load, and in many communities throughout this land they are making a vigorous effort to secure this class of business.

Another serious problem that the central-station has to face is that which relates to the cost of installation for every new range put in. For every kilowatt of maximum demand that is added to the lines of any power company they must figure on additional pole lines, transformer capacity, service lines, generating machinery and steam plant, in order to take care of this maximum demand; and it is fair to say that the cost of installation of an electric range to the power company today will approximate $50. Some authorities even place it higher than the figure given. So that it probably will require one and a half to two years in the average family, aside from the cost of the current furnished, to get the original investment back in dollars and cents.

### The Problem of Distribution.

A sixth limiting factor is the problem of distribution. At present a very large percentage of electric-range distribution is through the central station. The central station is primarily a producer and seller of electric current, and in many cases it has not wished to go into the merchandising of electrical ranges and other appliances, and has encouraged independent electric dealers and contractors to handle the business in this field. In other words, probably the next 20 years will witness the establishment of a large number of electrical contractors and dealers, but these concerns are numerically very small at present. Not all central stations by any means have selling organizations. They are equipped to render a quasi-public service, and do not always relish the extra expense of sales making. People do not go to central stations to shop, as they go to hardware and furniture stores.

I have mentioned six factors that tend to limit electric range production, and that point the direction in which it shall go. I will now mention the big pushing factor which is behind electric ranges and is bound to make them go ahead, even though they will not cover the earth as fuel stoves have practically done. The fact is that the electric range has many advantages which appeal to the consumer—the absence of smoke, ashes, gases and odors of all kinds, the comfort of electric range kitchens, especially in summer, and the fact that the heat is steady and even and that the oven produces wonderful results—these naturally are bound to appeal more and more to the housewife as the years go by.

## Urge Utilities to Help Make Liberty Loan a Success

One of the last official acts of Herbert A. Wagner as president of the National Electric Light Association was a letter sent to all member companies urging their co-operation in making the Liberty Loan a success.

Mr. Wagner's letter is as follows:

"Public service companies, by reason of their broad and close touch with a very large proportion of the population in the districts which they serve, and through their large number of employees, are in a position to exercise leadership in public welfare and patriotic movements. In the present emergency it is incumbent upon them to do all in their power, by action and example, to assist the government in its plans to prosecute the war.

"The first work before us is to insure the success of the Liberty Loan.

"In assisting the employees to acquire bonds on the installment plan our member companies can perform a national service of advantage, both to themselves and their employees, by becoming participants in the task of financing the government's needs for the present war.

"You are urged to adopt some plan to set before your employees in order to secure, through them, subscriptions to the Liberty Loan bonds in such sums as they may feel themselves able to pay for on the basis of a certain sum per week or per month for each $50 bond that they subscribe for.

"The success or failure of this loan must be determined by June 15. There is no time to lose. Your local banks would, no doubt, assist you in financing the aggregate bond subscription.

## Youngstown Company Secures 13,600 Horsepower in Two Weeks.

The Brier Hill Steel Company has closed a contract with the Mahoning and Shenango Railway & Light Company, Youngstown, Ohio, for the power to operate a large new plate mill which will be constructed immediately. The contract calls for 10,000 horsepower, as the mill will be entirely electrified from the lines of the central station. Within two weeks the Mahoning and Shenango closed power contracts for a total of 13,600 horsepower.

# Notes on Commercial Practice

***New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity***

## Demand for Appliances Will Increase Because of War Conditions.

Starting immediately and continuing indefinitely Byllesby electric utility properties will devote additional attention to the placing of electrical appliances in homes.

A circular letter to all managers on this subject, by Vice-President Arthur S. Huey, is quoted:

"High prices for commodities and labor and the drafting of men into the army and primarily essential war occupations, are rapidly causing a situation in American households enabling the vastly increased use of electric service for domestic purposes. Practically every electric household device is bound to be in greater demand from now on indefinitely. Scarcity of servants and their dismissal from necessity or economy will cause women of the well-to-do class to turn to mechanical helps to assist them in performing housework. The non-fluctuating character of electric rates will be a factor in causing many people who formerly regarded electric household appliances as luxuries to demand them as necessities. The cost of service will seem small compared to other increased expense.

"We believe that if proper advantage is taken of the situation a large quantity of electric household appliances can be placed at our properties during the remainder of the year, thus building up the earnings of existing customers and producing additional revenue without increased investment.

"We would suggest that you give the subject of selling electric appliances your very best consideration and call upon the ingenuity and sales ability of your force to promote successful endeavor along this line."

## New Electric Sign Installed at Syracuse.

The Syracuse Lighting Company has recently completed and placed in operation a large electric sign on the roof of its new substation on West Fayette Street, Syracuse, N. Y., as shown in the accompanying illustration. This sign, designed to encourage the establishment of local industries by attractive power rates, is one of the largest in the vicinity, being about 30 feet high and 75 feet long. The substation roof is 57 feet above the street, giving the sign a clear height of

**New Sign Erected by Syracuse Lighting Company.**

87 feet to the top, and affording an effective long range vision.

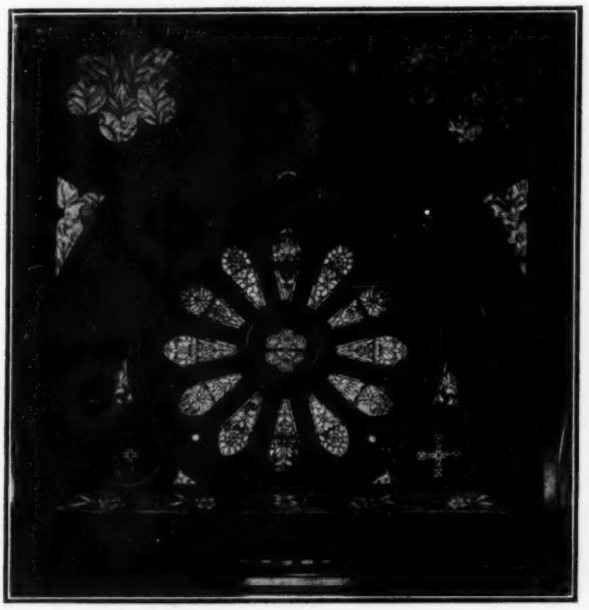
To attract particular attention to the city and its advantages, the company has eliminated entirely its own name and made Syracuse the important feature of the sign. This word is constructed of letters six feet high, while the line following, reading "Low Power Rates," is of four-foot letters. The sign consists of 906 10-watt tungsten lamps, and is being illuminated from dusk until midnight.

## LIGHTING OPPORTUNITIES IN STAINED GLASS WINDOWS.

**Considerable Business Is Available from Churches, Museums, Public Buildings, Etc.—Attractive Installations Are Possible.**

By Roscoe Scott.

Millions of dollars have been expended in the installation and upkeep of stained-glass windows by churches, cathedrals and public buildings. Under present prevailing con-



**Lighting of Cleveland Church Window.**

ditions these expensive works of art, many of them superbly beautiful memorials, lose their color and charm just as often as the sun goes down—or, for that matter, as often as it goes behind a cloud. We would object to having our church windows shattered by shell fire, yet until recently little or nothing had been done towards availing ourselves of their existence during the hours of darkness.

Fortunately, the comparatively low cost of modern flood-lighting now makes it practical to prolong the expressiveness of stained-glass artistry as many hours a day as may be desired. Particularly useful in this respect will be the newly developed lamps with special blue bulbs that act as ray filters, which have the power of illuminating glass in its true colors, free from the distortion that would be caused by ordinary yellow or yellowish light. By flood lighting with Mazda C-2 lamps, then, it is possible to duplicate with close fidelity the effect of sunlight streaming through the window.

The pioneer "daylighting" installation of this kind was dedicated on the evening of Easter Sunday last, when the artificial illumination of the eight-foot Tiffany "Rose Window"

over the chancel of the First Baptist Church, Cleveland, was officially put into commission.

It will be noted in the accompanying illustration that the general outline of the window is that of a Gothic arch. Three 600-watt Mazda C-2 lamps in No. 741 ("tennis lighting") reflectors, located on the chapel roof and tilted towards the windows at an angle of 30 degrees from the vertical, were used by the writer and C. L. Dows of Nela Park, who jointly engineered the installation, assisted by the Enterprise Electrical Construction Company.

The rich greens and blues of the foliage pattern in the window are brought out in a way that has called forth much appreciative comment. Those who have charge of promoting attendance at the church services are planning to use "The Church with the Flood-Lighted Window," or some similar phrase, as a slogan in building good will for the institution.

A somewhat similar campaign has been undertaken by a church in San Jose, Cal., which is featuring the lighting of its large Resurrection window in local notices of its evening services.

Evidently the most practical way of getting the churches to adopt flood-lighting installations is to suggest them when arrangements are being made for some special entertainment or other event. Seldom, indeed, will church trustees or other authorities permit an installation of this kind to be taken out, once its beautiful effect is observed. Paul Tafel of the H. C. Tafel Electric Company recently told the writer of a window back of the altar in a prominent Louisville Church that was flood-lighted for a wedding. The effect produced by a large gas-filled lamp with reflector, focussed on the window from the outside, he describes as "most beautiful."

### Possibilities of the Business.

The possibilities in art window lighting are not confined to religious institutions. As an example of their application to other classes of buildings, the Worcester (Mass.) Electric Light Company recently lighted a stained-glass window in the Worcester Art Museum. According to R. W. Rollins, president of the company, this window, which was made by Lafarge of New York, is the most expensive for its size in the United States. It measures 20 inches by 40 inches, and cost about $7,000. The design is that of a peacock. Owing to the density of the glass, the window could be seen in its full beauty only on bright sunny days. To supplement Old Sol, a 500-watt incandescent flood-lighting unit was located about 15 feet from the building, so as to project its direct rays towards the glass. The installation cost about $100, and has overcome all serious difficulties.

The greatest present market for flood-lighting equipment consists, of course, in "protective lighting." In building up a permanent demand for such equipment, however, and for the sale of energy that accompanies it, the thousands of non-lighted stained-glass windows throughout the country may well be taken into consideration.

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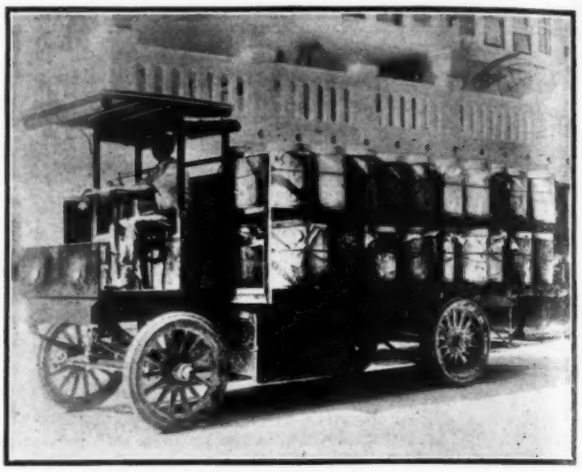
## Economies Effected by Electric Refuse Trucks.

The results achieved in Dover, England, by the introduction of electric trucks for refuse collection should be of great interest to municipal authorities of this country. The London *Electric Vehicle* prints the report recently presented by the deputy borough engineer giving the operating costs of the Dover "electrics" during 15 months' use.

"Five 2.5-ton vans are employed, and these, in the 15 months have dealt with 12,741 tons of house refuse—at the rate of 849 tons per month. In addition, the vehicles have done other work for which revenue was directly earned, such as conveying ashes from the docks and general carting for other departments. The comparatively small amount of such revenue-earning work done was due to the increased amount of house refuse that had to be dealt with—an average of 45 tons extra per week over the amounts in the previous year. In the days of horse haulage this would have necessitated the employment of five additional horses and carts at an extra cost of $4550 per year—an expense which the use of the "electrics" has saved.

"It should be noted that not all the vehicles have been in use the full 15 months, the last delivered having been at work only seven months.



Electric Refuse Truck.

"The expenses connected with operating the five electric vans for the 15 months are as detailed below:

Total mileage, 28,825.
Total annual mileage, 23,000.
Total quantity of refuse collected, 12,741 tons.

TABLE OF OPERATIVE COSTS OF ELECTRIC VEHICLES AT DOVER FOR 15 MONTHS.

| | Totals. | Percentage of total cost. | Cost per mile (cents). |
|---|---|---|---|
| Actual wages paid | $5,885.16 | 48.20 | 1.96 |
| Proportion of foreman's wages. | 186.62 | 1.60 | 0.624 |
| Wages of man at tip | 243.60 | 2.02 | ..... |
| Rents of two tips | 302.00 | 2.50 | ..... |
| Repairs and maintenance | 581.24 | 4.75 | 1.936 |
| Stores and sundries | 63.68 | 0.55 | 0.212 |
| Tires | 336.24 | 2.60 | 1.120 |
| Capital charges on vehicles (capital cost of each vehicle, $5,630) | 3,032.40 | 24.85 | 1.006 |
| Electrical energy at 3c per KWH. | 1,396.14 | 11.43 | 4.640 |
| Insurance | 180.00 | 1.50 | 0.600 |
| Total | $12,207.46 | 100.00 | ..... |

*Capital charges reckoned upon five vehicles in use from seven to fifteen months.

"Thus the total cost per ton of refuse collected was $0.919, which contrasts most strikingly with the previous cost of collection by horses and carts $1.48 per ton. The total cost per mile, excluding wages and capital charges, was $0.085."

A unique method of collecting garbage exists at Miami, Fla., where two 2-ton electric trucks with double-deck bodies carrying about 80 filled cans and 40 empties are employed. Each family must provide itself with at least two of the standard sized cans, and by city regulation, the top of each can must be first covered with a piece of newspaper before placing the metal cover on the can. When the owner is permitted to place the can on the street curb, and when the truck arrives the filled can is taken up and an empty one left in its place. No emptying of garbage cans is permitted in the streets, thus the trucks are kept clean as well as the streets and sidewalks, and all obnoxious odors are eliminated. No cost figures are available, but the owners of these novel garbage trucks claim that they have proven to be time and money savers over the horse-drawn vehicles previously employed.

## A MODERN ELECTRICALLY OPERATED ICE-CREAM PLANT.

### Factory of Lifter Ice Cream Company, Philadelphia, Pa., Uses Electricity Throughout.

Philadelphia is the greatest ice-cream manufacturing and consuming city in the world, and the electrically operated factory of the Lifter Ice Cream Company with the remarkable output of 10,000 quarts per day is perhaps the largest.

The company has outgrown its facilities five times in the past 20 years and now has an equipment for supplying 90,000 people with a plate of ice cream daily every day in the year.

Realizing the specific advantages of electrical operation from an economical as well as sanitary point of view, the company has equipped its factory throughout with electric drive, a total of 17 motors with an aggregate capacity of 139 horsepower having been installed.

Most of these motors are used for refrigerating purposes. No ice is used except for the preservation of the ice cream in its frozen state during its transportation from the factory to its destination.

The refrigeration is produced by a 30-ton York refrigerating machine connected by means of chain drive to a 60-horsepower, three-bearing, adjustable-speed induction motor, as shown in Fig. 1.

The cream is brought to the factory in sterilized cans from dairy farms where every precaution is taken to insure purity. It is pasteurized by the latest scientific process and forced through slow cooling coils until it reaches the proper temperature when it is automatically delivered to a silver-lined mixing machine, or homogenizer; the other necessary ingredients including sugar and macerated fruits, are also introduced and all thoroughly mixed into one homogenous mass. This machine is belted to a shaft driven by a 10-horsepower motor which also drives the cooling apparatus.

From the mixing machine the prepared cream is forced through a series of cooling coils, passing at decreasing temperature into the six 40-quart individual German-silver-lined freezing machines, each being driven by a three-horsepower induction motor as shown in Fig. 2. The cylindrical freezer is surrounded by a brine jacket, the brine being kept in constant circulation by the brine pump, which is driven by a 10-horsepower motor. When the cream reaches a consistency which will just permit of its being poured, it is drawn out of the freezers into ice-cream cans.

A particularly interesting feature of this installation is the method of determining when this consistency has been reached. This is accomplished by the installation in each freezer-motor circuit of an interesting ammeter which shows the current taken by the motor driving that particular freezer. Of course, as the cream hardens the motor performs more work and naturally the ammeter needle indicates this, so that it is a simple matter to graduate the ammeter scale to determine the consistency of the cream.

The cans containing the frozen cream are placed in a large refrigerating room with a temperature of about six degrees. where they are kept over night and dry hardened at an exceedingly low temperature.

Up to this point no ice is used. Every morning the cans are transferred from the cold room and carefully packed in ice and salt for delivery to the consumer or dealer.

Throughout the whole process absolutely hygienic and sanitary measures are used. In the entire operation, from the raw materials to the finished ice cream, the human hand does not come into contact with the material. Cement floors and enamel brick walls are washed every day and every machine coil and conduit through which cream passes is daily sterilized and cleaned by the passage of high-pressure steam.

Electric motors are also used to drive can washers, sterilizers, ice crushers, pumps, elevators and fans. The economy of electrical operation in making ice cream by the foregoing method as compared with the use of ice is very great. The extravagant use of ice and salt is unavoidable in the ice method. Then, again, improved sanitary conditions result from the use of electric drive.

The Lifter Company has 85 employees, 29 wagons and one automobile truck. The product is delivered in Philadelphia and Camden, and shipments are made by express to neighboring cities.

The motors are all of the induction type, designed for operation on a two-phase, 60-cycle, 220-volt alternating-current circuit. Current is furnished by the Philadelphia Electric Company.

## Electric Sign Records Progress of Liberty Bond Sales.

A 60 by 40-foot electrically illuminated flag, painted on canvas and stretched on the largest sign board in Louisville, will serve to record the progress being made by the Louisville Liberty Loan Legion, which canvasses the city on June 7, 8, 11, 12 and 13, in an effort to raise the $5,000,000 allotment of bonds in Louisville. The union was bare of flag stars when the flag was erected and the stars will be inserted as the campaign progresses, one for every $100,000 of the bonds subscribed for. This will provide for total subscriptions of $4,800,000 before the stars are all painted in their places. The Federal Sign System donated use of the sign, while the Louisville Gas & Electric Company installed it and will provide the illumination which will make the flag visible from the city's busiest downtown street.

Motor-Driven Refrigerating Machine in Foreground.

Battery of Motor-Driven Ice-Cream Mixers.

## Lancaster Power Booklet Indicates Rapid Growth in New Business.

The Edison Electric Company, of Lancaster, Pa., has just compiled an interesting booklet devoted to electric motor uses and describing a number of interesting industrial applications in its territory. The following tabulation indicates the rapid development of power business

| | Horsepower. |
|---|---|
| January 1, 1908 | 2,965 |
| January 1, 1909 | 4,233 |
| January 1, 1910 | 4,897 |
| January 1, 1911 | 5,519 |
| January 1, 1912 | 6,825 |
| January 1, 1913 | 9,298 |
| January 1, 1914 | 12,154 |
| January 1, 1915 | 14,802 |
| January 1, 1916 | 16,261 |
| January 1, 1917 | 20,748 |

H. J. Von Nieda is superintendent of the commercial department.

## New Street-Lighting Units Featured in Chicago.

The accompanying illustration shows an attractive advertisement recently published by the Commonwealth Edison Company, Chicago, Ill., calling attention to the value of ornamental street lighting as a business getter. The posts illustrated in the advertisement are of a new type, which are meeting with much favor among local merchants. The company rents the equipment to the customer at a flat rate, which includes cost of energy and maintenance.

NEW STREET POSTS BRING NEW BUSINESS
CO-OPERATE with your neighbor merchants. Install these good-looking, brightly lighted Electric Street Posts in your block. Encourage customers to bring their night-time trade your way — they will then remember your store and your service always — day and night.
'PHONE RANDOLPH 1280 FOR RENTAL OFFER
Ask for the Contract Department — Illuminating Division. Let us explain in full our liberal, low-cost, rental offer on these Street Posts. You will be surprised at the small sum for which you and your neighbor merchants can secure these business-bringing, beautiful Electric Street Posts. Get them now in time for Summer trade.
COMMONWEALTH EDISON COMPANY
72 WEST ADAMS ST.
CHICAGO

Advertisement of Chicago Company Featuring New Type of Post.

## Central-Station Service Replaces Municipal Plant in Hamburg, Pa.

The Hamburg Gas & Electric Company, a municipal plant supplying the borough of Hamburg (population about 2500) recently signed a contract and is now being supplied with current from the lines of the Metropolitan Electric Company, Reading, Pa. An industrial survey of this territory shows that of the 1881 horsepower required to drive its factories 460 horsepower are being supplied with central-station current, with a consumption of 264,000 kilowatt-hours a year, and 1421 horsepower are being driven from isolated-plant service, with an estimated consumption of 2,162,000 kilowatt-hours per year. This low percentage of saturation is due to the limited capacity of the steam plant which formerly supplied energy to this district. The industrial power department of the Metropolitan Electric Company is now cooperating with the Hamburg Company to obtain this additional prospective business. With a large capacity to draw on, and reliable service, a new steel company has been persuaded to locate in Hamburg, and a contract has been closed for service to an electric furnace of 250 kilowatts demand, with an estimated consumption of about 1,500,000 kilowatt-hours per year.

## Northern States Power Company Purchases Three New Utility Properties.

The Northern States Power Company has completed the purchase of the Northwest Light & Power Company, the Renville County Electric Company and the Minnesota Valley Power Company, all operating in Southern Minnesota, and began operation June 1. These utilities operate in 28 communities, having an aggregate population of 26,000.

The total capacity of the various power stations of the three utilities aggregates 2400 kilowatts. One of the plants is operated by water power, having a capacity of 400 kilowatts, which is capable of being increased to 900 kilowatts. The communities in which the companies operate are connected with the power plants by transmission lines aggregating 200 miles in length, and will be connected into the general transmission systems and large water powers of the Northern States Power Company.

The gross earnings of the companies acquired for 1916 were $198,000 and the net earnings $89,000. Approximately one-fourth of the towns served, however, were added late in the year, and it is estimated that the net for a full twelve-months' period would have been in excess of $100,000 for all of the communities now served.

## "More Than 3000 Uses for Electricity."

That electricity is invading every line of human endeavor is well known, but that there are more than 3000 applications of electric current in 109 trades and industries has hardly been appreciated. The Society for Electrical Development, after an exhaustive research, has just issued a booklet listing these applications. It has been sent free to all members of the society.

"More than 3000 Uses of Electricity" is a complete, up-to-date guide for sales managers, contractors and all sellers of electric service. It reminds them at a glance of new possibilities for the sale of additional energy in their localities. In these days every trade and industry is given special attention to modernizing its equipment on a more efficient and profit-producing basis.

The application of electricity in these lines of business, and elimination of old and obsolete methods, is every electrical man's war-opportunity.

This booklet is one of a carefully planned series to be issued in connection with the Society for Electrical Development's "Keep Business Going" campaign.

# Electrical Construction Notes

***A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment***

## FINE LIGHTING INSTALLATIONS BY A PROGRESSIVE SALT LAKE CITY CONTRACTING FIRM.

**Interior Lighting of Mormon Church Office Building—Flood Lighting of Its Exterior and of Other Buildings.**

The handsome new office building of the L. D. S. ("Mormon") Church at Salt Lake City, Utah, has cost over $1,000,000 and contains some of the handsomest of home products from the marble and granite quarries of Utah. The structure is five stories in height. It is of Grecian-Ionian style with 24 columns forming a colonnade about the outside and finished above with a lofty parapet of solid granite blocks. Inside the entrance hall is finished in golden traverses with the main stairway of Utah marble and travertine.

Further back is the main reception hall, 30 by 40 feet, with its 18 marble columns and beautiful stained-glass ceiling directly below the light well which reaches to the top of the building. Four light standards are placed about this room and six beautiful mural paintings about the walls.

Eardley Brothers Company, Incorporated, one of the best known firms of electrical contractors and supply dealers of Utah, is just completing the wiring and fixture work for the entire building. E. H. Eardley, the president of the company, was one of the electricians who installed the wiring and electrical fixtures in the great Salt Lake Temple and Tabernacle, and the result of his excellent work for the Church won him the contract for the new Church offices, and a most satisfactory piece of work has been done. The cost of installation of the electrical equipment amounts up to some $18,000. This includes the complete wiring, fixtures and elevator work. The bronze parts of the fixtures and switch plates are made of government specification bronze, each one individually scaled and tested.

Every fixture installed is of special design, the Brascolite line being featured throughout. The fixtures have been designed with the idea of harmonizing with the other equipment in the respective rooms, and a very pleasing result has been obtained. Perfect color harmony has been the theme of the architect, and the result is said to be really wonderful. Color and design harmony has been carried out even to such items as door knobs and electrical wall brackets. Young & Son Company, the well known architectural firm of Salt Lake City, is the architect.

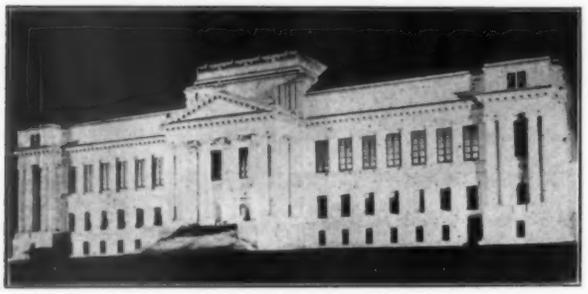
Flood Lighting of the Magnificent Office Building of the Mormon Church at Salt Lake City.

Flood Lighting of the Principal Tower of the Great Salt Lake Temple.

The accompanying illustration shows the result of the first experiment made in flood lighting two faces of the structure. The Eardley Brothers Company made the installation under the supervision of its illuminating engineer, K. M. Manookin. Further experiments are being conducted and negotiations are under way for showing the beauty of the entire building at night as well as day. Eighteen type L-1 General Electric 500-watt projectors were used in this first experiment of flood lighting the building, which has attracted much favorable comment.

The great Salt Lake ("Mormon") Temple was without doubt one of the most remarkable achievements for the time it was built. The total cost of the building and grounds was $3,469,118. The corner stone was laid April 6, 1853. The

building was finished and dedicated exactly forty years afterward. The building rests upon solid foundation walls 16 feet thick and 16 feet deep and covers an area of 4850 square feet. The figure of the Angel Moroni, which surmounts the



Flood Lighting of Utah University Administration Building.

central east tower is 12 feet 5½ inches high and stands about 200 feet above ground; it is made of hammered copper, gilded over with gold leaf. All of the exterior and most of the interior walls are of solid granite, hewn to the square, with the outside courses worked up to a very smooth surface. There are ornamental parts on the outside which represent the sun, moon and stars; these, together with the finials, the stones for the towers, the 800 solid granite steps each six feet in width extending from top to bottom of the building in the four corner towers, were hewn at great expense.

One of the accompanying illustrations shows the figure of the Angel Moroni flood-lighted. Eardley Brothers Company made the installation, which though only preliminary is quite effective, seven type L-1 General Electric flood-lighting projectors being used.

The company has been conducting a number of experiments in flood lighting various other buildings in Salt Lake City under the supervision of its illuminating engineer. The illumination of one of the university buildings is shown in the third illustration.

Negotiations are now under way for permanent flood lighting.

## Soldering Stranded Wire into Small Lugs.

By J. H. Lamoureux.

When soldering lugs to mains of lighting panels it is often the case that the lug that comes with the panel is too small to accommodate the size wire used, and as most panels come with part of the lug inclosed by the gutter slab I have found that a good way to take care of this is to peel the wire back three inches longer than required, bend back all the outside strands, then cut out part of the core. The remaining ends are then straightened and the whole is given a circular shape by twisting with the gas pliers until it fits the lug, into which it is securely soldered. By using this scheme there are no loose strands as when some of the outside layer is cut.

**Cutting Threads on Nipples.**—The conventional way to cut a short nipple is to cut a thread on a piece of pipe, then cut it off to the required length, after which this piece must be turned tight into a coupling on another piece of pipe, called a nipple chuck, so that the thread can be cut on the other end of the short nipple. Thus far everything is all right, but on withdrawing the nipple from the coupling you very likely find that a large burr has formed on the end that was in the coupling, and a tedious reaming job is before you. This trouble can be easily avoided by placing a knockout or a washer in the coupling between the two pieces of pipe. This will prevent the nipple from crowding into the other pipe and it will come out even more straight and finished at the end after the second thread is cut than before turning into the coupling. Charles Rubner.

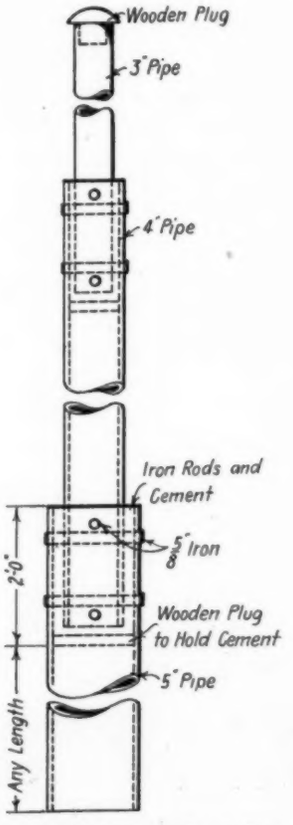
## Making Iron Poles Out of Scrap Pipe.

By Arthur S. Nickerson.

The accompanying illustration shows a method of making emergency iron poles, such as for outdoor lighting from overhead circuits, from old scrap pipe which can often be found around the plant. It may not be the best way, but it was a convenient way and may be of help to others situated as we were.

As shown in the sketch, the pole is made of three lengths of pipe lapped together about two feet and held in alinement by driving several one-quarter-inch round iron rods in the space between the pipes and then pinning them together with four three-eighths-inch round iron pins. Afterwards the spaces between were filled with cement and the top covered with a wooden cap to keep out the water.

These make good, substantial poles that when set in cement will last a life time. If you have scrap pipe on hand,




Iron Pole Made from Scrap Pipe.

use it up and don't make it necessary for the now already overworked plants to ship one or two odd poles to you. Incidentally, you have your pole when you want it and not six months after you have got all over needing it.

**Marking Holes for Switch and Cutout Blocks in Cabinets.**—In marking the holes in switch and cutout blocks before drilling into the back of the cutout cabinet, if a match is ignited and immediately thrust into the holes of the slate or porcelain when the block is in its proper position, the afterglow will leave a white or sometimes black mark on the painted surface of the metal. This is much quicker and easier than trying to mark the holes with a tool, nail or pencil. A. Pertle.

## Replacing an Armature Without Damage.

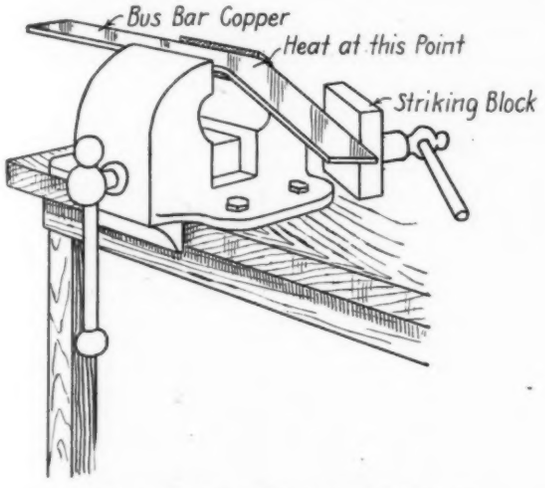
By M. J. Moriarty.

Costly damage to a motor armature frequently occurs from improper handling after it has been repaired. This can be prevented by using the following method. When hoisting the armature to replace it, wrap a piece of fiber around the armature where the hoist rope winds around; this will prevent the rope from damaging the armature winding. When the armature is half in place and the hoist rope is shifted to the shaft end the fiber can be taken off and then the armature can be placed into position without danger to the winding. Many large armatures are damaged and delays have occurred because the windings were damaged from the rope hoist.

## Bending Busbar Copper.

By H. B. Stillman.

It is frequently necessary, in preparing busbars for heavy switchboards and the like, to make what might be called sidewise bends, that is, bends in the same plane as the body of the bar instead of at right angles thereto. When the bar is quite heavy this is a difficult thing to do satisfactorily. However, the job may be quite easily and quickly done by heating the copper bar with a blow torch to a dull orange




Method of Bending Busbar Copper Edgewise.

color. Apply the heat only exactly at the point where the bend is to be made. This local heating draws the temper and reduces the copper to a soft and pliable state. By placing it in the vise it may now be easily bent around to the desired angle with comparatively little force, using a hammer and a striking block of wood or fiber to prevent hammer marks on the edge of the bar.

## Among the Contractors.

Leigh G. Garnsey has been awarded the contract for installing a lighting system on Main Street, from Summit to Ocean Avenue, Huntington Beach, Cal., on his bid of $13,497.

Aubry & Wire, Tacoma, Wash., received contract for electric wiring and installation of electric machinery at the plant of the Tacoma Shipbuilding Company, at $4000.

J. F. NePage of NePage, McKenney Company, electrical engineers and contractors, with offices in all the chief coast cities, has returned from a trip along the coast as far south as the Mexican border. He was visiting the various offices of the company and investigating business conditions generally.

Ensch & Dean, who have been engaged in electrical work in Sheboygan Falls, Wis., for the past six months, have dissolved partnership. Mr. Dean will continue the business and Mr. Ensch, who retires from the partnership, has made no definite plans for the future.

Walter H. Smith, of Van Nuys, Cal., has taken over the electrical business formerly operated by J. E. Hendricks, in the same city.

The Seattle quarters of the Pacific States Electric Company are to be moved about July 1 from 307 First Avenue, South, to 570 First Avenue, South. Business has grown to such an extent that it was found necessary to procure larger quarters. A considerable sum of money has been expended on the new quarters to make them adequate for the transaction of business. During the past two weeks the company has taken orders from the Alaskan Engineering Commission for $15,000 to $16,000 worth of electrical supplies.

The Johnson Electric Shop, of Marshfield, Wis., has purchased the electrical supply business of T. W. Young of that city.

A. E. Carpenter has opened an electric shop in the Powers Building, Mauston, Wis., and will handle a full line of electrical supplies, including electric ranges. Mr. Carpenter was formerly in the employ of the Mauston Electric Service Company.

The Electric Motor & Repair Company, 264 Halsey Street, Newark, N. J., has secured adjoining property at 266 Halsey Street for extensions. William Heidrich is president.

The Beaver Engineering Company, 59 Mechanic Street, Newark. N. J., has been awarded a contract for electrical work in the building of the Mutual Benefit Life Insurance Company, Broad Street. Paul H. Jaehnig, 109 Bank Street, will also do electrical work in the structure.

The Collins-Wagner Manufacturing Company, 244 West Twenty-ninth Street, New York, has received a contract from the Central Railroad of New Jersey for electric lighting fixtures for its new passenger station on Broad Street, Newark, N. J., at a cost of $3,970.

Electrical contractors at Pittsburgh, Pa., and other sections of Allegheny County have adopted the following advance in wages in conference with the local union: August 1, from $5 to $5.50 per day; April 1, 1918, $5.50 to $6 per day, and such to expiration of present contract, July 1, 1919. Other conditions remain as present, including eight-hour day, time and half-time for overtime, and double time for work after midnight, Sundays and holidays.

The Associated Electrical Contractors of Paterson and Passaic, N. J., have adopted the following resolutions and forwarded to Mayor Amos H. Radcliffe, Paterson, through Secretary H. W. Desaix: "Realizing that not only the federal, but also the state and municipal governments, will be during the existing state of war taxed to their utmost; and

"Whereas, Every good citizen should offer his or her services to try and help the officials who are responsible for the welfare and protection of the community; there be it

"Resolved, That every member of this association, who for reasons is exempt from military duty, shall be at the call of the mayor for any duty which, in his judgment, we can best perform."

J. E. O'Connor is president of the association.

# The Dealer and Storekeeper

***An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances***

## POSSIBILITIES OF THE ELECTRIC SIGN.

**Some Pertinent Merchandising Suggestions Based on the Experience of a Successful Dealer.**

**By Kenneth C. Cardwell.**

Outside of the larger cities—and in some of the larger cities, too—it is perfectly safe to say that the electric-sign business is as yet in its infancy, due solely to the fact that business men have not been sold on the advertising value of these devices in an aggressive and convincing manner. The things that have been done where the right kind of selling methods have been followed indicate what can be done elsewhere, and show the kind of results that can be obtained from intelligent cultivation of the field.

So backward is the development of sign work in many towns that business men who desire electric signs frequently have to go to contractors with their ideas, and sometimes they are sent to distant cities by their local electrical men, with the plea that sign work is out of their line, and that there is nobody to handle it in the town. This should not be the case in any town where there is even a single electrical contractor, and certainly not where there are several.

In a word, this business is sufficiently valuable, considered from all angles, for somebody in every town to take hold of it and aid in its development, for the good of all concerned. Once it gets well started it moves along almost by its own momentum; but even a toboggan requires steering, and even so rapidly growing a business as that of installing electric signs requires some assistance on the part of those who are interested.

In particular, the co-operation of the local central station is all but indispensable, if only because it is the central station which is most directly benefited. This is so obvious that the contractor who has any sign business on hand or in prospect should not hesitate to take the matter up with the local company, securing the fullest possible data on the matter of maintenance, especially the hours of operation of the sign and the cost down to cents per day, if possible. Such information should not be difficult to obtain, and the executive in charge of the commercial department of the central station will invariably be found more than willing to afford every assistance.

"The chief value of this sort of information to me has been in proving to prospects that the cost of keeping an electric sign running is a good deal less than might be thought," said an electrical man who has built up a profitable sign business of his own. "I have found that most business men in our town think that it costs more than they can afford to run a sign, whereas the reverse is true, except, of course, for these big affairs. I get detailed figures showing exactly what it will cost to run a sign with a certain number of lamps of a certain size for a certain number of hours every night; and these figures, I have found, are usually so low, as compared with the prospect's former ideas, that they almost sell the sign.

"With the figures, however, I also show a design which I have worked out, using the prospect's ideas and my own, and embodying something a little out of the ordinary, if possible. At least, I submit something which is not unsuitable, and which gets the best results at the minimum expenditure; and this, coupled with the low cost figures which I have, obtained from the central station and from other users of signs, makes a combination which is hard to turn down."

MUST CO-OPERATE WITH PROSPECT.

The obvious desirability of having something definite to sell is frequently overlooked, however, by sign men, even those who are experienced in the business; while the great majority of dealers who might be handling a good sign business assume what might be called a receptive attitude. That is, they make no effort to interest business men in electric signs, but will make an effort to put one up if a customer desires it. They attempt little in the way of suggestion, and seldom submit a complete design. It is all up to the customer.

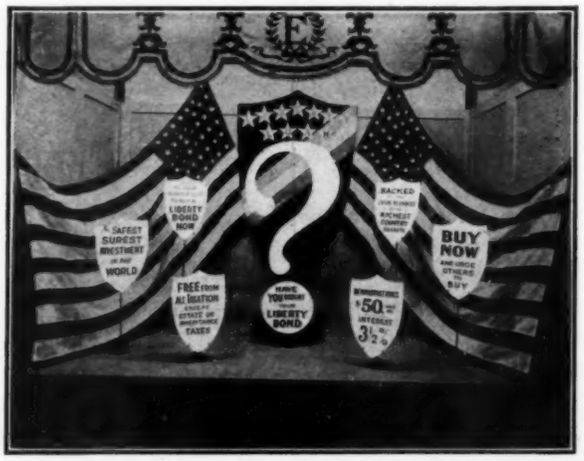
This attitude, of course, is not calculated to produce business. It will never give a town a "great white way" made by flaming signs; it will not give the central station a big night load, nor the contractors a big volume of work in constructing and installing signs. And yet the business is there, as the experience of the contractor convincingly shows.

DESIRABILITY OF THE BUSINESS.

The desirability of the business from the standpoint of the contractor, of course, lies in the profit of the job, for which a reasonable sum may be charged, just as the central station's interest is in the added night consumption of energy. So valuable is the latter that many companies have a salesman or two devoting a good deal of time to the development of sign business, working up prospects and closing them for signs, with the aid of some contractor who knows how to handle the business. An arrangement is frequently made by which the whole cost of the sign can be paid in monthly installments with the customer's electric bill.

## A Liberty Bond Window Display.

The accompanying illustration is a suggestion for a "Liberty Loan" window display which electrical dealers can install at a very low cost. As in the case of the naval-enlistment campaign, the government needs the support and co-operation of all business interests and the electrical industry can and is being of great help.




**Suggestion for a Liberty Loan Window Display.**

# Saleswomen for Electrical Stores

## *Women Are Better Qualified Than Men for Selling Household Electrical Appliances—Experience Of An Ohio Dealer —How to Get the Best Results from Electrical Exhibits*

By G. D. CRAIN, JR.

POSSIBLY because the electrical dealer has developed from the electrical contractor, whose place of business was not outwardly attractive, the average member of the trade has been slow to invite girls or women to become parts of his selling organization. He uses them in the office, of course, but between that and the front of the store there seems to be a great gulf fixed. It just isn't done—at least, in most places.

But it is interesting to note that when this happens, and the young woman is recognized as a potential selling factor of importance, she proceeds to make good. Perhaps the very difficulty of getting a position of this kind fires the imagination and stirs ambition, but the fact remains that in many instances the work done by feminine "salesmen" has been better than that accomplished by those whose chief recommendation was that they happened to wear trousers.

In a certain Buckeye city, for instance, one of the principal electrical stores has a young woman doing selling work for it, and she has shown exceptional ability in getting the business. So many of the appliances handled by electrical stores appeal to womenfolk that it is a great advantage to have someone with the feminine viewpoint to explain the advantages of this equipment to them. The woman customer may have questions to ask that she would not feel free to ask of a man; but it is easy for her to put the question and get the answer from one of her own sex.

### Women Understand Requirements of Housewife.

For instance, the weight of a vacuum cleaner may be a question. The salesman might anticipate this by having the prospect handle the cleaner herself; but the girl who is demonstrating it makes a point of meeting that possible objection by showing how easily she herself uses the cleaner, and with how little fatigue the work may be accomplished. The prospect might insist to a man that the machine was too heavy, but another woman would "call her bluff" by demonstrating that the effort required was small.

Then, again, a woman who is studying the sales end of the business—and it is a peculiar thing that few office employees would think of working out suggestions pertaining to the business-getting end of the store—can criticise the appearance of the establishment along constructive lines, and be of real help to the dealer in making his place of business attractive, at least more attractive than it ordinarily would be to women visitors.

This is an important thing, too; for the fact mentioned above, that appliances used in the household are a large factor in the business of the electrical store, has a corollary in the fact that women buy them, and that womenfolk, therefore, must make up a considerable proportion of visitors to the store. If it is not prepossessing in appearance, the difficulty of making a sale is increased; and, likewise, the opportunities to make sales are reduced, because many women will not come into a store that does not look "nice."

A woman employed in the office may have ideas about the proper appearance of the store, but she is unlikely to express them. But one whose work is in the sales department, and whose keen sensibilities respond to the favorable or unfavorable influences of her environment, will know whether the store is all it should be, and if it is not she will call attention to them. At least, the one referred to above, whose work has been a considerable factor in the retail selling success of the concern with which she is connected, has done so.

### How Appearance of One Store was Improved.

"Look here, Mr. Boss," she said one day to the head of the establishment, "why don't you have the cracks in the floor filled? It looks awfully unattractive just now, and the change would help. Then we could have the floor varnished. After that, it wouldn't be a bad idea to get a rug or two for the front of the store, and to display the vacuum cleaner on it, instead of on top of the display case, where it is now."

The boss had listened a little open-mouthed as these suggestions were made, but he didn't resent them, or attempt to check the flow; he is a successful business man, and most successful business men know that the way to profit from having clever and intelligent employees is to get them to express themselves, and to make suggestions. So after taking in the ideas of the young woman who was charged with the job of selling electrical appliances to other women, he admitted that they were good, and proceeded to make the changes which she had indicated.

A little later on, pleased with the result, he went to her for advice on a selling plan which he was thinking of starting.

"I notice," he said, "that some of our competitors are advertising trial installations of their cleaners. What do you think of using the same scheme here?"

The girl thought it over a moment, and then shook her head.

"I wouldn't," she said. "If we put them in on trial, a lot of women will get their house cleaning done with the assistance of our cleaners, and then will send them back. Along in the fall they'll make a second bid for a trial installation, and won't make the investment. That would be a good thing for a washing-machine or something else which is used every week, but too many women would be tickled to death to use the cleaner just as an extra help in their house-cleaning."

This instance is related not because the writer agrees with this view of the trial installation of vacuum cleaners; but it certainly shows how a woman develops merchandising sense, and how she applies her knowledge of feminine psychology to the problems connected with her every-day work. Even if she makes a mistake now and then, the dealer at any event has had the benefit of seeing the thing from the other side, and is in a position to make up his mind more intelligently.

### Women in Charge of Exhibits.

Another way in which young women are useful is in handling exhibits of electrical goods at shows of one kind or another. The electrical appliance has the advantage of novelty in many instances, and things that are electrically operated will usually get the attention of the crowd. Therefore, the concern which is on the lookout for methods of promoting its business not infrequently puts on an exhibit at some local "exposition," while during Electrical Week it may happen that it will be appropriate to have a special display at some central point selected by the trade.

It is often hard for one of the members of the organization who is handling various details not connected exclusively with selling to get away to run the exhibit; at the same time, if it is to prove of value, it must be in charge of someone who knows. And women are likely to be numerous in any crowd attending a public display, so that here again it is of advantage to have someone who understands the feminine viewpoint. All of these things suggest the advisability of using a girl as the representative of the company at the display.

The Ohio company referred to has had a number of such exhibits recently, and all of them have been in charge of a young woman. She has been able to handle everything that came her way with neatness and dispatch, and the amount of business developed at these exhibits has been sufficient to show the value of the plan. Incidentally, the representative of the store has enjoyed getting away from routine for a few days, and bumping up against new problems connected with handling the crowd at an exposition.

One of the meetings was a home economics affair, and all sorts of household goods, as well as food products of all kinds, were displayed. The line of the electrical dealer fitted in very well with the general idea of the exposiiton, since all of the labor-saving devices carried in stock were evidences of the movement toward more economically managed and operated homes. And here, as it was natural to expect, most of those who came to the show were women.

Another display was made at a hospital convention, attended by superintendents of hospitals, women being in the majority among them also. The display in this case included not only such appliances as vacuum cleaners, which can be used to good advantage in large buildings such as hospitals, but some therapeutic appliances, many of which are coming into general use. In fact, it would be exceedingly difficult to find a meeting of any kind in which there was not some point of contact with the electrical business, and to which the dealer would be unable to make a practical and interesting appeal.

The electrical concern in question has tried out the plan of operating a branch store, and in working out the experiment put its young woman representative in charge. She was thus trained not only in selling, but in the administration of a store, and was given experience in window trimming, etc., work which she took considerable interest in and showed special adaptability for. Experience of this kind is invariably broadening, and one who has been given the more or less responsible task of making a branch store show a profit over and above the cost of operation will come to appreciate the fundamentals connected with overhead expense, etc., more clearly than ever before. And it is along these lines, of course, that a woman is likely to be weak at first.

### Cheap Help Is Expensive.

One thing which the dealer who is willing to make use of the services of a young woman in his sales promotion department should guard against, however, is the idea of trying to save money in this way. A good saleswoman is as valuable as a good salesman, and payment should be adjusted on the basis of the volume of business handled rather than on the sex of the person handling it. But there is little reason to doubt that the growth of the business and the development of retail, over-the-counter trade will find women playing a bigger part in the selling of electrical goods, just as they are now being taught to play a bigger part in buying them.

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**Damage to Utilities in Kentucky.**—Numerous electric light and telephone companies suffered damage to plants and wire systems in the series of tornadoes which recently swept the western part of Kentucky and other sections of the Mississippi Valley.

## Utilizing Valuable Show-Window Space.

Merchants along streets in the busiest sections of our large cities have to pay a large rental for comparatively small store and show-window space. Consequently it is highly desirable to utilize every foot of space to good advantage. This must be done, however, without giving the idea of crowding. A New York City electrical dealer in the Hudson Terminal building makes use of the usually wasted space in the bottom of the show window below the customary floor of the window. This space can be utilized as effectively as the space in show cases within the store and requires about the same kind of lighting equipment to make the display effective when the daylight is too meager or absent.

In the particular window referred to and illustrated, the feature display is the Violetta high-frequency violet-ray apparatus made by the Bleadon-Dun Company, of Chicago, and being marketed very successfully by electrical jobbers and local dealers in many parts of the country. It is a compact yet powerful and inexpensive generator of violet rays which can be used by the layman as readily as by the physician for pleasant and effective treatment of rheumatism, lumbago,

Using Show-Window Space Usually Wasted.

neuritis, etc. These equipments are meeting as large a sale in many quarters as electric vibrators and a display of them in an electric shop will attract even more attention than a vibrator because of the novelty of the apparatus to the general public. It is for this reason that the Violetta equipments were made so conspicuous in the show window illustrated, forming the feature of the main part of the window as well as the special "subway" portion. Vacuum cleaners were shown in the background of the display.

Some dealers have found that the lower section of the window can be used with special effectiveness for displays of things that interest little people; for instance, electric toys. These will always attract children and thereby also cause grownups, who may be accompanying them, to stop and look.

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**Johns-Manville Moves to Larger Quarters in Pittsburgh.**—The splendid increase in business and the need for greater floor space and facilities for displaying Johns-Manville products, necessitated a change in location of the H. W. Johns-Manville Company at Pittsburgh on May 20. On this date, new and larger Johns-Manville showrooms and sales offices were opened on the ground floor of the Westinghouse Building, corner of Ninth Street and Pennsylvania Avenue. These new quarters provide ample space to accommodate the increasing business, and are located in the heart of Pittsburgh's business district, within a few minutes' walk from the Union Station.

# New Electrical Appliances

***A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances***

## New Arrow Weatherproof Sockets.

The Arrow Electric Company, Hartford, Conn., has just placed on the market two molded-composition weatherproof sockets, known as Nos. 60,666 and 43,310. These sockets are

**New Molded-Composition Weatherproof Sockets.**

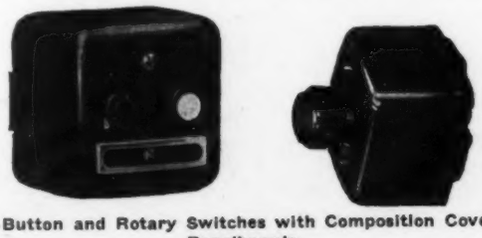
grooved for weatherproof shade-holder, and are equipped with six inches of No. 14 B. & S. stranded rubber-covered wire.

## New Push-Button and Rotary Switches for Panelboards.

Panelboard manufacturers, contractors and others who assemble control boards will probably appreciate the advantages of the new push-button type of switches manufactured by the Bryant Electric Company of Bridgeport, Conn. These switches are designed to be mounted directly on the busbars of standard panels by means of two machine screws which pass through the flexible self-adjusting contacts of the switch into holes tapped in the copper busbars of the panel. These same screws also serve as the circuit or electrical connection between the switch and the busbars.

The National Electrical Code permits a minimum spacing between busbars of opposite polarity of ¾-inch for 125 volts and 1¼ inches for 250 volts, but as the spacings at the fuses must be 1-inch for 125 volts and 1¾ inches for 250 volts, it is the practice to space the busbars 1½ inches on centers for 125 volts and 2¼ inches on centers for 250 volts.

As the screw holes in these switches are spaced 1¼ inches on centers both ways, it will readily be seen that the switches can be used on 125-volt panels with straight busbars, and that the space between the ends of the busbars of the same polarity may be ¾-inch greater than is necessary with other makes of switches—thus effecting an actual saving of 1½ inches of copper bar per switch. On 250-volt panels it is of course necessary to bend the ends of the buses in to reach the switch. The covers of these switches are substantial molded insulation cups, rectangular in shape with all front edges nicely rounded. Below the buttons of each switch there is a metal card holder designed to hold a lettered card designating the circuit controlled.



**Push-Button and Rotary Switches with Composition Covers for Panelboards.**

These switches are made in both 10-ampere and 20-ampere capacities, 250 volts, standard push-button type, and can also be had in the lock type. A rotary indicating panelboard switch can also be had with a rating of 10 amperes, 250 volts. This switch is attached to the busbars in the same manner as the push-button type—and if desired can be readily converted into a lock switch by substituting for the standard form of handle a universal lock attachment.

## New Appleton Conduit Fittings.

The Appleton Electric Company, 218-230 North Jefferson Street, Chicago, Ill., is continually adding new types to an already extensive line of conduit fittings. Among the fittings recently added are those illustrated herewith.

Figs. 1 and 2 show two new types of terminal fittings for motor installations and combination work. They are intended for inside use only. The one shown in Fig. 1 has a

**Figs. 1 and 2.—Types SEA and SEC Terminal Fittings for Motor Installations.**

three-wire cover and Fig. 2 shows one with a two-wire cover. The wires are protected from any sharp edges on the conduit by a ledge on the inside of the porcelain cover. These covers are interchangeable for one-half and three-quarter-inch conduit.

Figs. 3 and 4 show two new types of entrance fittings, the former being a fitting intended for use on horizontal conduit. It has a slight offset in angle, which permits of a straight pull on the wires while they are being installed.

**Figs. 3 and 4.—Types SEB and SED Entrance Fittings.**

This fitting has a three-wire porcelain cover, which is readily interchangeable with the two covers shown in Figs. 1 and 2. The special fitting shown in Fig. 4 has been designed to meet the demand for a small, light and durable entrance fitting. The same parts can be used from one-half, three-quarter and one-inch conduit, except that a special hub is used for each size conduit. Both the top cover and the porcelain cover are interchangeable for all sizes. The top cover is easily removed to allow a straight pull while drawing in the wires. This fitting can be used either on vertical or on horizontal conduit.

Figs. 5, 6 and 7 show special one-piece rings and cover,

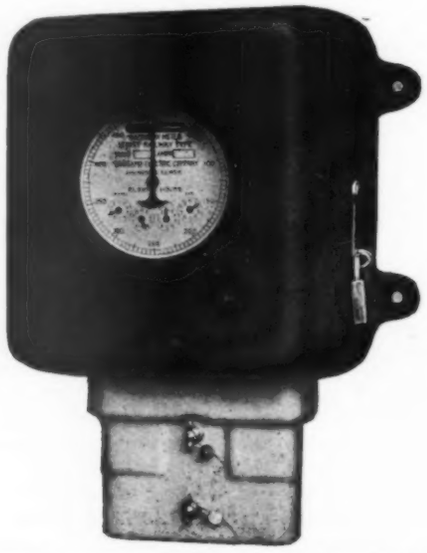
or rather bottom, plates for use in concrete buildings. These take the place of the ordinary conduit box. The ears shown at the bottom are screwed to the floor or other surface while the concrete is being poured, nails being just as satisfactory for this as screws. The knockouts in the sides leave

Figs. 5 and 6.—Bottom Plate and Type RC-2 One-Piece Ring with Pear-Shaped Holes Making It Unnecessary to Remove Screws from Ring. Fig. 7.—Type RC-3½ Ring with Flanged Bottom Plate Attached.

plenty of space between the conduit and the finished surface. The bottom plate has a flange, which laps over the ring to prevent concrete from seeping in while it is being poured. This bottom plate has five one-half-inch knockouts and holes for attaching fixture studs.

## New Economy Meter for Street-Railway Service.

The operation of electric street and interurban cars can be made wasteful or economical, depending on the skill and care of the motorman. To promote economy it has been found desirable to install meters to record the consumption. A meter with this function has now been developed by the Sangamo Electric Company, Springfield, Ill., that is known as the "Economy" meter. It has a cyclometer type dial, which records kilowatt-hour consumed. The mechanism of the



Sangamo Economy Meter for Electric Traction Lines.

meter has been so designed that there is an extremely slight drag of the rotating part in order to operate the cyclometer train, but provision has been made whereby the torque required to operate this train is of constant value, which makes the actual drag on the meter practically negligible. A view of one of these meters is shown in the accompanying illustration.

## IMPROVEMENTS IN THE STREET-LIGHTING SYSTEM OF THE CITY OF CHICAGO.

### Flame Arcs to Be Replaced by Mazda C Series Lamps.

The steady increase in the cost of material and supplies has been a source of anxiety to those men responsible for the operation and maintenance of electrical apparatus and it has resulted in an endeavor to make use of such improvements in equipment and operating methods as tend to a higher efficiency.

This condition found the Department of Gas and Electricity of the city of Chicago with an increasing street-lighting load and a decreasing appropriation per unit operated.

To meet this condition, a study was made to determine some means by which the operation and maintenance costs per unit might be reduced while the standard of service rendered the public was maintained or increased.

Fig. 1.—Cutter Street-Lighting Fixture to Be Used in Chicago.

That part of the street-lighting system which showed a marked tendency to increase the maintenance cost and at the same time was deteriorating in service, consisted of the 10,000 flame arc lamps installed during 1912 and 1914.

To find a substitute for these lamps, the use of which would allow the maintenance saving to absorb the cost of replacement within a reasonable time, was the subject of a careful study of various lamps suitable for street illumination

Among the limits imposed on this substitution were the capacity and character of the regulating equipment forming a part of the flame arc system and the necessity of eliminating any devices that would increase the first cost or add to the maintenance charges.

As part of the municipal street-lighting system there are now in use approximately 15,000 600-candlepower 20-ampere Mazda type C or gas-filled tungsten lamps. These lamps are mounted at the same height and spaced the same as flame arc lamps. The resulting street illumination has in every in-

stance compared very favorably with that given by the flame arc lamps.

With this knowledge as a basis, it was assumed that incandescent lamps having a mean horizontal candlepower of 600, and a total light flux of 6000 lumens, would when installed in place of the flame arc lamps, prove a satisfactory substitute insofar as illuminating characteristics were concerned and result in considerable operating economy.

The investigation resulted in the selection of a 10-ampere straight-series, 600-candlepower, 6000-lumen type C Mazda lamp, mounted in a cast-iron pendent fixture with enameled-steel reflector and diffusing glass globe, manufactureed by the George Cutter Company, South Bend, Ind. These fixtures will be supported at the same points now occupied by the flame arc lamps.

The fixture illustrated in Figs. 1 and 2, was selected from among several others, principally on account of the fact that

Fig. 2.—Fixture with Globe Swung Down for Cleaning or Lamp Removal.

the body of the fixture is made of cast iron, heavily galvanized and painted, which gives the most durable fixture body that can be produced. Cast iron, as is well known, cannot be dented or bent out of shape in handling as is the case with fixture bodies of sheet metal, and as the cast iron is galvanized, no deterioration through rust will occur and it will only require painting at long intervals in order to preserve appearance.

This fixture is equipped with the Regent film socket, illustrated in Fig. 3, also made by the George Cutter Company. This socket was selected because it was found to give a more uniform puncture voltage than any other socket, thus greatly increasing the lamp life by reducing line surges. It is well known that if a film requires a high voltage to build up before puncturing, this will cause a temporary great increase in current immediately after puncture occurs which places very heavy strain on the remaining lamps in the series, rendering them liable to burnouts which they would not suffer under their regular voltage. This is particularly true of gas-filled tungsten lamps, as these work at a temperature much nearer to the melting point than do the vacuum-type lamps.

Another important advantage of this socket is that only the properly calibrated film furnished with and for these sockets can be used, which is a great improvement over other types where pieces of paper, matches or twigs can be substituted.

The method used to support the socket, as shown in Fig. 3, allows the lamp filament to be adjusted to any vertical position desired with reference to the diffusing globe and reflector. At any later date, the film socket may be removed and an autotransformer with multiple socket, illustrated in Fig. 4, substituted therefor.

The work of making the change from the arc lamp to the new fixtures will be performed by the employees of the Department of Gas and Electricity and it is expected the work will be completed by the middle of September.

Fig. 3.—Interior of Fixture Equipped with Cutter Regent Series Film Socket.

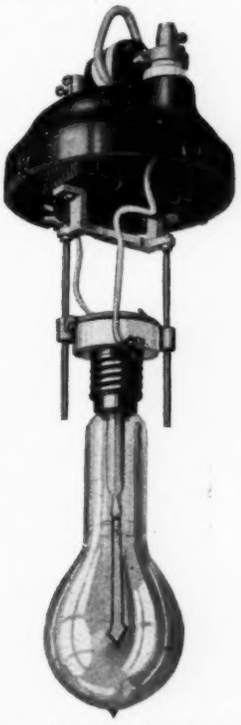


Fig. 4.—Interior of Fixture Equipped with Compensator and Multiple Socket.

Taking into account the portion of this year that flame arc lamps will be operated, there is still enough saving from the operation and maintenance fund to pay the cost of the change. The saving expected for 1918 and the following years will approximate $168,000 each year, or $16.80 per lamp per year.

A large portion of this cost reduction is effected by the selection of a lamp with the life and energy characteristics balanced to fit the system on which it is to be used. The balance of the saving is effected by a reduction in the attendance charges, as the new fixtures will not require any trimming and very little patrolling, thus allowing the displaced help to be used for other portions of the system. The heavy expense for carbons will also be eliminated and as the fixtures will be handled so little, breakage in globes will be greatly reduced.

It is expected that the example set by the city of Chicago will be followed in other cities, because with the present demand for materials, a very considerable saving in the initial cost of a new system may be realized from the sale of scrap metal in the old lamps.

## A NEW UNIT FOR INDUSTRIAL LIGHTING.

By Ward Harrison and Earl Anderson.

In street lighting, flood lighting, and stereopticon projection, the rigid control of light permitted by the concentrated filament of the Mazda C lamps enabled the development of systems of refractors, parabolic mirrors, and lenses, doubling or quadrupling the effectiveness over the old type lamps and bringing unexpected extensions of application. For general interior lighting, the advantages of the point source have been less evident. As a matter of fact, because of the increased brightness attendant upon the filament concentration, many systems of lighting previously serving passably for vacuum lamps have been found to provide insufficient eye protection with clear-bulb Mazda C lamps. This is especially true in factories where from motives of economy open reflectors were installed almost universally.

By the simple expedient of frosting the lamps—which entails only a very moderate lessening of the light output—the apparent size of the light source is expanded, nullifying the concentration and securing a degree of diffusion at least equivalent to that of the clear-bulb vacuum lamp. For some locations where a still better diffusion of light is desired, glass semi-inclosing units, composed of a reflecting top with an opal diffusing bowl below, are suitable.

In contrast to the methods referred to above is the principle of a new form of industrial lighting unit illustrated in Fig. 1. This is a development designed to utilize advantageously the concentration of the filament in a small coil. A clear-bulb lamp is provided with a metal cap of

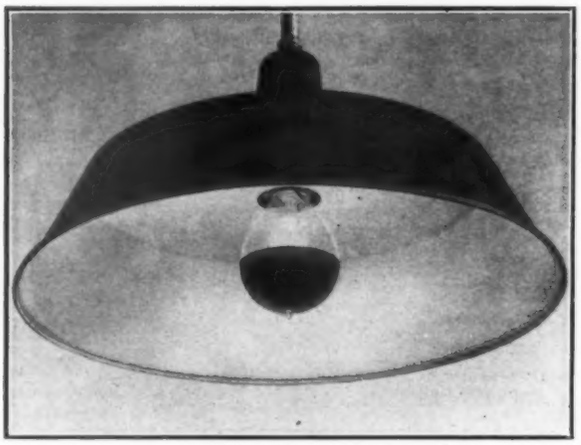


Fig. 1.—New Unit for Industrial Lighting.

proper contour, silvered and polished inside. This intercepts the direct rays from the filament and redirects them so as to illuminate evenly the upper reflector, which is twenty inches or more in diameter. Such an arrangement is practicable only for Mazda C lamps; in the vacuum type it is precluded by the length of the filament barrel.

In ordinary open reflectors, a major part of the useful light comes directly from the lamp, and as this very largely determines brightness and shadow effects, only a moderate increase in diffusion is attainable by increasing the reflector size. However, when the reflector is made a complete secondary source as in the new unit, brightness and shadow softness are found to be directly dependent upon the reflector area.

Data recently presented before the Illuminating Engineering Society[1] have indicated the limits of intrinsic brilliancy for light sources in order that they may not appear unpleasantly bright when viewed casually against a background of specified intensity. Based on the amount of light usually reflected from the ceiling and walls in a factory, these data would limit artificial light sources to a brilliancy of 1 to 1.5 laberts (approximately two to three candlepower

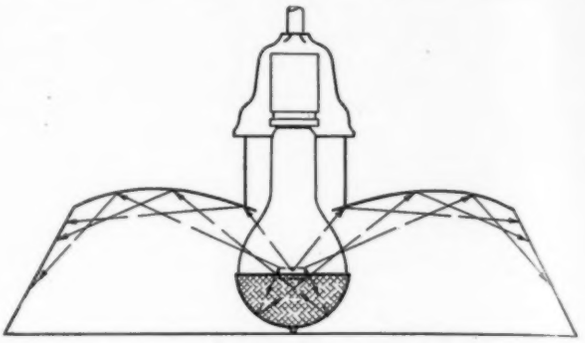


Fig. 2.—Cross Section of Unit with Silvered Lamp Cap.

per square inch of apparent area) if the sensation of glare, as defined above, is to be avoided.[2] Applied to the problem in hand, this means that when a 200-watt lamp is used the apparent source of light should be at least 20 inches in diameter. With usual mounting heights, this diameter is also a minimum from the standpoint of securing a satisfactory degree of shadow softness; consequently no reflector smaller than 20 inches is recommended in connection with this system, even though from the standpoint of brightness alone a smaller size might suffice for use with 100 and 150-watt lamps.

The porcelain reflector is of special design with a concave upper surface as shown in Fig. 2. The portion of light specularly reflected is turned to the outer band for rediffusion, thus equalizing the brightness of the unit. Specular images are also avoided thereby without depolishing the reflector, and no striations are cast upon the floor.

The high initial reflecting efficiency of the cap is not subject to the usual impairment from dirt collection, since it is held closely to the lamp bulb by a spring suspension.

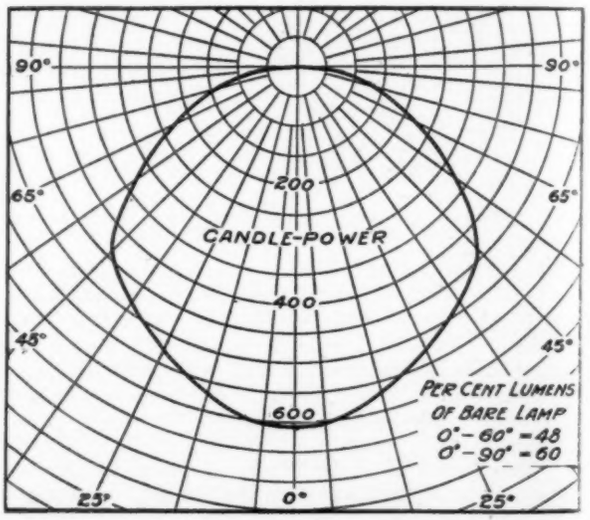



Fig. 3.—Characteristic Light Distribution from New Unit with 200-Watt Mazda C Lamp.

This arrangement also prevents the tarnishing which would take place rapidly in a free circulation of air.

[1] "Effects of Brightness and Contrast in Vision," by P. G. Nutting. Transactions Illuminating Engineering Society, Vol. XI, No. 9.

[2] Where the direction of the light sources forms but a small angle with the line of vision and the units are continuously in view, as in an auditorium, still lower limits should prevail; however, in factories where overhead lighting is employed, these conditions are not the rule.

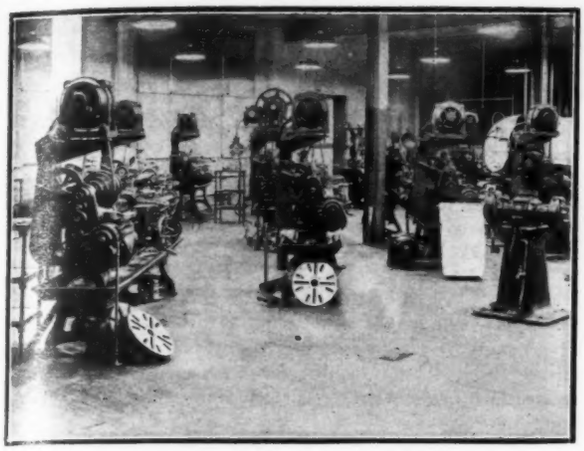


Fig. 4.—View of Machine-Shop Lighting with New Units. Engraving Made from Unretouched Photograph.

Artificial lighting with this system is characterized by three principal effects:

1. Light sources of entirely comfortable brightness when viewed at all angles.

2. Soft, even reflections from glossy, polished, or oily surfaces.

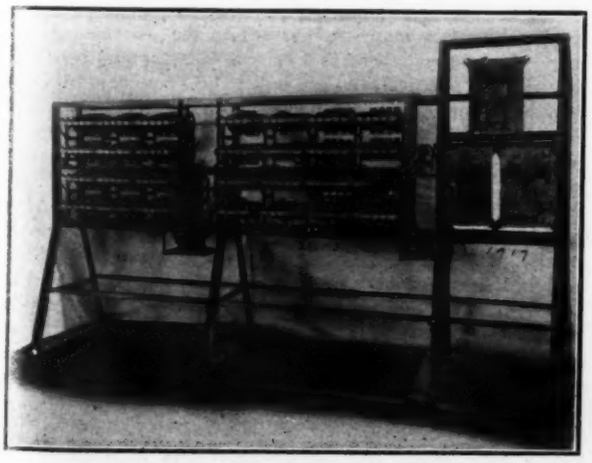
3. Luminous shadows with graded outlines.

These effects are illustrated in the unretouched photograph of Fig. 4 taken at eye level in a machine shop. Here the local lamps formerly used were found unnecessary under the new system of lighting. A typical photometric polar-flux curve for the unit with a 200-watt lamp is given in Fig. 3. It will be noted that the light distribution is rather strongly downward, so that when uniform illumination is required the units should be spaced 1.4 to 1.5 times the height above the working plane. Tests show the effective illumination in foot-candles to be but from 10 to 20 per cent less than for standard porcelain reflectors with clear lamps.

Particularly in high-grade machine shops, plate-glass works, inspection processes and similar activities requiring high intensity and, therefore, larger lamps, the glare from open reflectors becomes especially objectionable. In these works, the unit described permits the use of ample illumination for the most accurate discrimination of detail without subjecting the eye to unnecessary discomfort and fatigue.

## A Flasher of Unusual Size and Capacity.

The celebrated slogan sign at Toledo, Ohio, is being equipped with a new flasher as shown in the accompanying illustration. The compactness and simplicity of design of the flashing apparatus is specially noteworthy. There are 132 switches in addition to the solenoid controls. The center drive is a departure in flasher construction and by this means perfect transmission without undue bearing and gear loss is attained. The motor at the end drives a 12-switch section of the flasher which operates the engine wheels, car wheels, and track of the big sign and the rheostat causes the motor to come up to full speed in graduated steps, giving the accelerating effect in the wheels and track; the solenoids act as master control switches.



Large New Flasher for Toledo Slogan Sign.

The display operated by this flasher consists of a three-overlay sign, flashing first the reading matter, "You Will Do Better in Toledo," with a highly colored revolving border effect; next a steamship with smoke pouring from the funnels, waving flags, and an ocean-wave effect; lastly, an express train coming on full head, then coming to a stop and gradually starting up again.

The flasher was designed and built by Reynolds Electric Company, Chicago, Ill.

## New Westinghouse Type of Catenary Hanger.

After careful consideration, with a view to securing a hanger which could be furnished at a minimum cost to customer and of a minimum weight consistent with the strength necessary to properly perform its functions, the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has placed on the market the hanger illustrated

The hanger rod consists of a three-eighths-inch steel rod with an oblong loop at the upper end for attaching to the messenger cable. After the hanger is in place, this loop can be closed very easily. At the lower end of the hanger rod is a loop with a round opening for connecting to the clamping

New Hanger for Catenary Trolley Wires.

bolt. The clamp is made in two halves, which are duplicates, and is of malleable iron with lips of minimum thickness to secure satisfactory operation with wheel trolleys. The hanger bolt consists of a seven-sixteenths-inch carriage bolt provided with a square nut and lock washer, and is so located that when the groove of the trolley wheel is worn to the maximum depth there is no tendency for the flange of the wheel to strike the bolt.

# Activities in the Trade

**Landers, Frary & Clark,** New Britain, Conn., have issued a new revised price list on Universal electrical appliances, effective June 1.

**Flour City Ornamental Iron Works,** Minneapolis, Minn., has issued an attractive booklet devoted to municipal lighting and illustrating and describing the various standards which it manufactures.

**Western Electric Company** has leased a building in St. Louis, Mo., in which will be established a school for the education of young men, teaching them the building and installation of telephone switchboards.

**Globe Stove & Range Company,** Kokomo, Ind., has appointed the Smith-Perry Electric Company of Dallas, Tex., distributor throughout Texas and Oklahoma for electric ranges and heating devices manufactured by this company.

**Wagner Electric Manufacturing Company,** St. Louis, Mo., announces the appointment of F. T. Coup, formerly connected with its Chicago office; to take charge of its Milwaukee office, in its new location, the First National Bank Building.

**American Insulation Company,** Philadelphia, Pa., recently incorporated with a capital of $100,000, has filed plans for the erection of a two-story factory, about 85 by 130 feet, at Roberts Avenue and Stokley Street. B. T. Conwell, Jr., is head of the company.

**The Virginia Potteries Company,** New Lexington, O., has acquired a site of about six acres at South Charleston, W. Va., for the erection of a new plant for the manufacture of poreclain insulators for electrical service. The proposed plant is to give employment to about 500 hands.

**Betts & Betts Corporation,** New York City, announce the purchase of the manufacturing and selling rights of the Mason monogram talking sign and carriage call, which has been exploited in the past by the National Electric Sign Company of New Jersey. Numerous improvements have been incorporated in the operating mechanism, embodying many patented features of the Betts products.

**Templeton, Henly & Company,** 1022 Central Avenue, Chicago, has issued a large folder on the uses and advantages of its Simplex pole jack. This tool is used very extensively for construction and maintenance of overhead pole lines. These uses are described and illustrated. A partial list of users of these jacks is given, which includes many of the leading utility companies throughout the country.

**National X-Ray Reflector Company,** Chicago, Ill., has perfected a plan whereby employees can purchase Liberty Loan bonds through the company on the partial-payment basis. As a further inducement, A. D. Curtis, president of the company, has agreed to give one $50 bond for each $1000 subscribed by employees. Recipients of the free bonds are to be determined by lot.

**National Carbon Company,** Cleveland, Ohio, has had reprinted a paper entitled "The Characteristics and Uses of the Flaming Arc." This was prepared by William Roy Mott, of the company's research laboratory, and appeared in the March, 1917, issue of the *Journal* of the Cleveland Engineering Society. It discusses the electrical and illumination characteristics of these lamps and points out their adaptability for blue-printing, portrait work, motion-picture studios, factory lighting, etc. Special attention is given to the discussion of "Silver Tip" carbons for such lamps.

**Packard Electric Company,** Warren, O., has established a district office in the San Fernando Building, Los Angeles, Cal., in charge of J. G. Monahan, district manager. This office will handle Southern California and Arizona on all products of the transformer department. Inquiries from this territory should be directed to the Los Angeles office where facilities have been provded to render prompt and courteous service.

**National Conduit & Cable Company,** 41 Park Row, New York, N. Y., in the last issue of "Copper Gossip," dated May 21, reports general business conditions and industry progressing favorably. There has been substantial activity in the market for copper lately, with an upward trend to prices. Regarding prospects for the future, it is stated that new copper producing territory has been opened, smelter and refining facilities have been greatly enlarged, and the prospect is for a new record-breaking production. There is therefore not the shade of an excuse for boosting market prices to any previously unattained limit. Such a scheme would justly deserve to prove an ill-fated experiment, according to the company.

**Holophane Glass Company, Incorporated,** 340 Madison Avenue, New York City, has issued booklet No. 114, entitled "Holophane Developments for Type C Lamps." This is a valuable publication, which goes into the technical as well as commercial features of Holophane prismatic glassware. The advantages of the type C Mazda lamp over the type B lamp are shown to be not only higher efficiency, but more perfect reflector design. The various types of Holophane units, suitable for type C lamps, are described. Numerous data, distribution curves and illustrations of typical installations are given. A new type of show-window reflector, known as No. 922, is specially described; also the combined reflector and refractor unit, No. 2110, besides others that have already come into very extensive use. Interesting suggestions and diagrams are given on how to determine the proper type and size of reflector to use.

**The Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has just announced the granting to its employees another advance in wages, effective May 16, amounting to 10 per cent. This will affect all of the working shop and practically all of the office force, except a few of the higher salaried employees. This is one more of a number of raises in wages granted to the workmen of the shop, which raises represent a general increase in a period of two years of practically 40 per cent. The Westinghouse Company has never made a practice of granting horizontal raises to the entire force, but has rather pursued the policy of granting the increases to cases of individual merit, basing same on the accomplishments of each individual employee. The gradual increase in the cost of living has made it imperative on the part of the company to enable its employees to meet these changed conditions. The Westinghouse Electric & Manufacturing Company has also subscribed for a number of Liberty bonds which it offers to its employees, permitting them to pay for same in small monthly or semi-monthly installments. The management has laid out a comprehensive plan for handling subscriptions, making it exceedingly easy for any employee to subscribe, and the advance in wages mentioned above will also serve to add to the facility with which these subscriptions may be made by the employees.

# Personal and Biographical

R. C. COFFY, manager of the Everett Gas Company, Everett, Wash., has been appointed chairman of the Red Cross Publicity Committee.

E. S. NANCE has been elected president of the Oswego (Kans.) Light, Power & Supply Company, which recently was reorganized.

J. M. BARRY, of San Francisco, Cal., who recently resigned as chief of the city department of electricity, was tendered a farewell banquet at the St. Francis Hotel.

EMIL C. SCHROEDER, formerly superintendent of the light department, Manitowoc, Wis., has been appointed general superintendent of that city's municipal plant.

N. C. DRAPER, manager of the Sioux Falls (S. D.) division of the Northern States Power Company, has been elected president of the South Dakota Electrical Association.

T. D. CROCKER, assistant general manager of the Minneapolis General Electric Company, has also been appointed assistant general manager of the Northern States Power Company.

PAUL B. FINDLEY, formerly editor of *Electrical Age*, New York City, has accepted a position in the department of publicity, Westinghouse Electric & Manufacturing Company, with headquarters at East Pittsburgh, Pa.

JAMES E. LATTA, of the Underwriters Laboratories, Chicago, Ill., and formerly associate editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN delivered an address recently before the Electrical League of Cleveland, entitled "New Tendencies in Safety Work."

B. W. MENDENHALL, for nine years sales manager of the Utah Light & Railway Company, Salt Lake City, and later in the electrical supply business in Salt Lake City has assumed the management of the local branch of the Miller-Cahoon Company, automobile distributers.

B. F. MIESSNER, who became well known through his investigations and lectures on radio control of torpedoes, has become expert radio aid in the United States Navy and is in charge of the radio laboratory at the Navy Aeronautic Station at Pensacola, Fla. In the May number of the *Naval Flying Corps Monthly* he contributed an article entitled "Development of Aircraft Radio in the Navy," in which some of the results of the work achieved in the laboratory mentioned are recorded.

STEPHEN E. DILLON, who was elected president of the Arkansas Association of Public Utility Operators at its annual convention, held on May 16-18, has been general manager of the Public Utilities of Hot Springs, Ark., since October, 1911. The water, gas, electric light and street railway properties are under his management. Previous to that time Mr. Dillon had twenty-nine years of service with steam railroads. He entered the service of the Burlington system as a messenger boy in 1881.

GEORGE H. STORMS, for many years associated with the Fort Smith Light & Traction Company, Fort Smith, Ark., has been promoted to the position of auditor for the Ottumwa Railway & Light Company, Ottumwa, Iowa.

J. H. RISSER, for a number of years manager of the central-station department of the Globe Stove & Range Company, Kokomo, Ind., has been appointed manager of electric sales, with complete charge of future electric-range development work for this company.

LUDWIG KEMPER, who until quite recently was secretary-treasurer and manager of the Minnesota Gas & Electric Company at Albert Lea, Minn., and later was connected with the Field-Richards Company of Cincinnati, Ohio, has been appointed president, manager and purchasing agent of the Spokane (Wash.) Heat, Light & Power Company.

J. J. CARTY, chief engineer of the American Telephone & Telegraph Company, has received his commission from President Wilson as senior major of the Signal Corps Reserve. Twenty-five companies are to be formed from the

**Major J. J. Carty.**

Bell operating companies, each company to be made up of one captain, two first lieutenants and an average of about 100 non-commissioned officers and men, with one major and an extra lieutenant (his adjutant) for each two companies, a total of about 100 officers and 2,500 non-commissioned officers and men.

DONALD MCDONALD, vice-president and general manager of the Louisville (Ky.) Gas & Electric Company, is "doing his bit" on several different counts. Recent assignments he has accepted include the chairmanship of the registration board for the Fifth District, comprising two wards of the city, and a place on the board which will direct a five-day campaign in Louisville to sell the city's allotment of $5,000,000 Liberty Loan bonds.

C. NESBIT DUFFY, vice-president of the Manila Electric Railroad & Light Company, Manila, P. I., who recently returned to the islands from the United States, has been elected president of the Friendly Sons of St. Patrick. He also had the honor of presiding at a dinner tendered some weeks ago to the visiting "American Honorary Commercial Commission." Mr. Duffy was previously comptroller of the Milwaukee (Wis.) Electric Railway & Light Company.

F. R. WINDERS, formerly general superintendent of the Southern Wisconsin Electric Company at Lake Geneva, Wis., has been made general superintendent of the Ashland (Wis.) Street Railway Light & Power Company and the Bessemer Railway & Light Company. Mr. Winders has been in charge of the Southern Wisconsin Electric Company since its purchase in November, 1916, from the Equitable Electric Light Company.

WILLIAM T. DEAN, who for some nine years was in charge of the Power and Mining Department of the Chicago office of the General Electric Company, has resigned his position to become president of the General Combustion Company, with offices in the Monadnock Building, Chicago. After graduating from the electrical engineering course at Armour Institute of Technology, Mr. Dean served some time in the testing department of the General Electric Company's main works at Schenectady. He later became superintendent of the electrical department of the Illinois Steel Company, at the South Chicago Works, which position he held five years. In 1906 he joined the Chicago organization of the General Electric Company and two years later was placed in charge of the Power and Mining Department. The company of which he has become president has developed a new type of oil-gas furnaces, for use in heating-treatment of steel and miscellaneous metalurgical processes. These furnaces are being built on basic patents and are said to be characterized by exceptional fuel economy.

## OBITUARY.

ARTHUR GUNN, president of the Wenatchee Valley Gas & Electric Company, residing at Wenatchee, Wash., was killed on May 24, when his automobile overturned pinning him beneath it. Mr. Gunn came to Wenatchee in 1892 and has been active in business affairs there ever since. He started the Columbia Valley bank, selling his interest in 1894. In 1896 he organized what is known as the Pioneer Ditch Company. He was also president of the Central Washington Gas Company. He served the state in the legislature as a Democrat, representing Chelan and Kittitas counties in 1905-7. He leaves a wife and six children.

# Current Electrical News

## WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

### EASTERN STATES.

BRIDGTON, ME.—The Western Maine Power Company, which recently took over the plant of the Bridgton Water & Electric Company, will soon erect a transmission line to connect the local plant with the transmission lines of the Cumberland County Power & Light Company.

FORT FAIRFIELD, ME.—The Limestone (Me.) Light & Power Company, represented by Aubrey C. Frost of Limestone, has petitioned the Public Utilities Commission for authority to furnish electricity in certain portions of the town of Fort Fairfield.

BASKING RIDGE, N. J.—The Township Committee has called an election to vote appropriations for electric lighting and elect new lighting commissioners.

DOVER, N. J.—The New Jersey Power & Light Company is furnishing electric power to the Wharton Steel Company Wharton, for the operation of equipment at the works. The steel company has placed two furnaces in operation and will soon inaugurate a third, giving a total capacity of about 1,100 tons.

ELIZABETH, N. J.—Upon recommendation of Runyon & Carey, consulting engineers, 843 Broad Street, Newark, the City Council has ordered the postponement of proposed plans for the erection of a municipal electric lighting plant until the coming year.

FREEHOLD, N. J.—The Board of Public Utility Commissioners has granted the Monmouth Lighting Company permission to issue $400,000 in bonds and $267,000 of capital stock, part of the proceeds to be used for extensions and betterments.

NEWARK, N. J.—The Public Service Electric Company has made a proposition to the Common Council for furnishing electric service for lighting and elevator operation at the City Hall. The company estimates that it will cost about $10,000 for necessary equipment to utilize the central-station service and that the annual saving will total about $5,000.

ROSELLE, N. J.—The Marconi Wireless Company of America is building an extension to its plant in the Aldene section.

TRENTON, N. J.—The State House Commission is planning for the installation of stokers, grates and other equipment at the power and boiler plants of the different state institutions to reduce the present fuel cost. The work will include the Rahway Reformatory, estimated cost, $60,000; State Hospital, Vineland, estimated cost, $7,000; State Hospital for Insane, Trenton, estimated cost, $31,000; State Hospital, Morris Plains, estimated cost, $45,000.

HAMBURG, PA.—H. C. Stambaugh and S. S. Seyfert have organized local electric companies to operate in Upper Tulpehocken and Upper Bern, Berks County.

JOHNSTOWN, PA.—The power plant of the Morrellville Coal Mining Company, Morrellville, was destroyed by fire May 29. The company is planning to rebuild, and for present service has arranged for power supply from the lines of the Citizens' Light, Heat & Power Company.

MILLERSBURG, PA.—The Millersburg Electric Company is making rapid progress in the installation of new boiler and other equipment at its station. Construction has been commenced on a new line to Halifax, by way of Berries Mountain. The company has arranged for mining operations in the Wiconisco Creek section for coal supply for the station.

PHILADELPHIA, PA.—The Hulton Dyeing & Finishing Company will build a one-story power house addition, 35 by 130 feet, at its plant, Coral and Walnut Streets.

PHILADELPHIA, PA.—Contract has been awarded to William Linker Company, Heed Building, for the erection of a new power plant at the city home for feeble-minded, Byberry, on its low bid of $76,900.

PHILADELPHIA, PA.—The Philadelphia Electric Company has taken out a permit for the construction of its proposed new one-story power plant addition to its station on Delaware Avenue, at a cost of $120,000. The company is also taking bids for the erection of an addition to its substation on Schuylkill Avenue.

PHILADELPHIA, PA.—In connection with the new bridge and viaduct to be erected by the city at Thirty-fourth Street and University Avenue, over the Schuylkill River, it is planned to have a 400-foot bascule span to be electrically operated. The structure is estimated to cost $1,000,000. The Bureau of Surveys is preparing plans.

PITTSBURGH, PA.—The Public Service Commission has granted the application of the West Penn Traction Company to consolidate with its subsidiaries under the name of the West Penn Railways Company, with capital of $20,000,000, to unify the different properties and reduce operating and fixed charge expenses. The companies included in the merger are: Brownsville Street Railway Company, Greensburg & Southern Electric Street Railway Company, Latrobe Street Railway Company, Pittsburg, McKeesport & Connellsville Railway Company, McKeesport & Irwin Railway Company, Pittsburg, McKeesport & Greensburg Railway Company, Masontown-Morgantown Street Railway Company, Union Radial Street Railway Company, West Penn Interurban Railway, West Penn Traction Company, and White Electric Traction Company. Samuel Insull has been elected president and John F. Gilchrist vice-president.

SHAMOKIN, PA.—The local station of the Pennsylvania Lighting Company was destroyed by fire June 1.

WILMINGTON, DEL.—The Wilmington & Philadelphia Traction Company has filed plans for an addition to its power station on the Brandywine River.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company has taken bids for the erection of an addition, about 40 by 67 feet, to its station on Lexington Street.

WASHINGTON, D. C.—In connection with the plans of the War Department for the construction of cantonments for the emergency army, electric lighting systems to be installed are estimated at $604,000.

WASHINGTON, D. C.—To meet the war demands of the government, the Chesapeake & Potomac Telephone Company is planning to spend $750,000 in Washington in the near future. This will include the establishment of a new downtown exchange "Franklin" at a cost of $225,000 to act as a relief service for the Main exchange. Another $80,000 will be spent in plant and accounting improvements. Additional toll boards will cost $35,000 and switchboards at various city exchanges will cost $75,000.

CHRISTIANSBURG, VA.—The Elliott Mutual Telephone Company has been incorporated with a capital of $1,000. L. B. Lester, manager.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company has called a meeting of stockholders on June 21 to increase the capital from $12,500,000 to $16,000,000 for extensions and betterments.

NEWBERN, N. C.—The Home Telephone & Telegraph Company will erect an exchange here.

RALEIGH, N. C.—The Palmetto Power & Light Company is making a survey for a transmission line from Laurinburg, N. C., to a point on Wateree River to secure power from Wateree Power Company. Address Charles E. Johnson, president, at Laurinburg.

COLUMBIA, S. C.—An extension line is proposed by the Columbia Railway, Gas & Electric Company to prospective site of army camp, a distance of 10 miles. Address Alfred Wallace, manager.

EASTMAN, GA.—The Georgia & Southern Utilities Company will build a new transmission line from Eastman to Chauncey, Milan and Ryan, about 18 miles. The lines will carry 22,000 volts.

### NORTH CENTRAL STATES.

SPRINGFIELD, O.—The Ohio Electric Company will be extended from Cincinnati to Defiance. Address A. Benham, general manager, Springfield.

EVANSVILLE, IND.—It is understood that a capitalist of Clay, Ky., will install an electric light plant at Dixon, Ky. The plan is to string an electric line from Clay to Dixon, this plan having been agitated for some time past. The town board at Dixon has been "sounded" regarding a franchise for lighting the city.

COLLINSVILLE, ILL.—Having just completed the installation of a new 1,500-kilowatt turbogenerator, which brings the capacity of the plant to 2,500 kilowatts, the Southern Illinois Light & Power Company announced plans to install this year a new 3,000-kilowatt generator of the same type, which will more than double the present capacity. Address J. J. Frey, general manager, Hillsboro, Ill.

MURPHYSBORO, ILL.—Recently the deal was closed whereby the Murphysboro company became the owner of the Metropolis Telephone Company. About $15,000 will be spent on improvements at Metropolis, and extending a long-distance wire to Vienna; besides the company will at an early date erect a modern office building for the exchange which will cost somewhere in the neighborhood of $6,000. Guy Brown will assume charge for the new company for the present.

SPRING GROVE, ILL.—The Carey Electric & Milling Company has been incorporated with $5,000 capital to sell electric current for lighting and power purposes. Address Walter Carey.

WENONA, ILL.—The contract is awarded for the new telephone exchange building for Wenona to A. B. Kipp, of Minonk. The building will be a fireproof structure. The improvements for the Wenona exchange will include a new switchboard and other equipment at a cost of between $10,000 and $12,000.

CALUMET, MICH.—Work will start soon on the rebuilding of the outside plant of the Michigan Telephone Company at Lake Linden. The improvements contemplated will make it possible to handle at least double the present number of subscribers.

SAGINAW, MICH.—General Manager J. A. Cleveland of the Saginaw Bay City Railway Company announced plans for relaying of double tracks on the Genesee Avenue bridge, which will necessitate the expenditure of about $30,000.

EAU CLAIRE, WIS.—The Wisconsin Telephone Company will make improvements and extensions to the amount of $30,000. The work will largely comprise placing all telephone wires in the business district underground.

GRAND RAPIDS, WIS.—The Wood County Telephone Company has decided to erect a new telephone exchange building here.

NEENAH, WIS.—The Board of Public Works will extend ornamental lighting system on the boulevard to Lake Shore to cost $1,300. Address City Clerk.

STEVENS POINT, WIS.—The Wisconsin Telephone Company will build a new rural telephone line from this city to the Purdy farm, a distance of about five miles.

STEVENS POINT, WIS.—A 44,000-volt transmission line from Mosinee to Stevens Point is to be built by the Wisconsin Valley Electric Company, with an extension to Junction City. The latter municipality has granted permission to the

company to run its line to that place and has also entered into a contract for the installation of a modern street-lighting system. The line from Mosinee to Stevens Point will be about 35 miles long and will connect with four different water power plants owned by the company.

WAUPON, WIS.—A white-way lighting system is to be installed here, according to plans and specifications prepared by Vaughn & Meyer, of Milwaukee. Installation work will be done by O. Danielson of Waupon.

EMMETSBURG, IA.—A petition has been made for a franchise for electric lighting and heating by the Commonwealth Utilities Company of Mankato, Minn.

LITTLE ROCK, IA.—A bond issue of $15,000 was carried at a recent election, the proceeds to be used to install a municipal electric lighting plant. Address mayor.

PELLA, IA.—An electric railway will be built in connection with the Wabash railroad system. Address D. S. Umbenhauer, 932 Park Street, who is a director in the Lafflet Electric Railway Company and one of the promoters.

ATWOOD, KANS.—Election will be held June 19 to vote on the proposition of issuing $20,000 in bonds for the purpose of extending and improving the electric lighting system.

BURLINGAME, KANS.—The City Council is planning on improvements in the light plant and the city clerk has been instructed to get the relative cost of the improvements proposed.

BURLINGTON, KANS.—The City Council has decided to improve the city electric light plant. The city clerk has been instructed to secure needed information as to the cost of an additional Corliss engine and dynamo constituting a second unit. Address Mayor Vanner.

DOUGLAS, KANS.—The bond election to vote on a $5,000 issue for an electric lighting system carried.

INDEPENDENCE, KANS.—The Union Traction Company, operating city and interurban lines, has contracted with the Kansas Gas & Electric Company for power for all its system from Parsons, Kans., to Nowata, Okla. The Kansas Gas & Electric Company, sometime in the future, will erect a $1,000,000 electric plant.

JUNCTION CITY, KANS.—The local electric railway is planning the construction of large underground coal pits for storing coal in large quantities. The addition of two large engines to take care of the increasing demands on the plant, is also scheduled for the near future.

KANSAS CITY, KANS.—The M. & K. Telephone Company has purchased ground in Argentine, on which it proposes to erect a building to take care of its business in Argentine, Armourdale and Rosedale.

LONG ISLAND, KANS.—The election carried to issue bonds for $8,000 to build an electric transmission line connecting with the Phillips light plant.

OBERLIN, KANS.—Electrician Miller has made a contract with the city council of Atwood to plan and design an electrical plant for that city.

ST. MARYS, KANS.—D. A. Course, of the Rocky Ford Power Company, is figuring with the city relative to supplying electricity. The company has made a contract with the officials of Alma and McFarland and will cross the river at Wamego. The company hopes to have its lines in shape to handle the proposed trolley line when it is put through.

GRAND ISLAND, NEB.—A part of the flume at the Central Power Company plant at Boelus collapsed May 28 and has put the generating part of the plant out of commission for several weeks.

HUMPHREY, NEB.—The electric company has reorganized. The new owners will arrange an entirely new set of wires all over the town so that unlimited service can be given where needed. Frank Wheeler is local manager.

BISMARCK, N. DAK.—The McLean County Farmers' Telephone Company, recently incorporated, will construct a line in McLean County during the summer.

FARGO, N. D.—Three of the incorporators of the Cheyenne Valley Light & Power Company, which will furnish power by high-tension line from Valley City to Dazey, Sanborn, Rogers and other points in the southeastern part of the state, met in session at the Gardner Hotel. They were K. G. Schmidt of Grand Forks, a civil engineer; R. M. Stee of Dazey and L. C. Thomas of Fargo. According to a statement made by Engineer Schmidt, the line will be furnishing power to Dazey, Rogers and possibly Sanborn by fall, and that it is now proposed to make extensions to Hannaford and Wimbledon. The power is obtained from Valley City municipal light plant. The company is incorporated at $50,000.

## DATES AHEAD.

Electric Power Club. Spring meeting, Homestead Hotel, Hot Springs, Va., June 11-14. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Electrical Contractors' Association of Pennsylvania. Annual convention, Philadelphia, Pa., June 19-21. Secretary, M. J. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Chemical Engineers. Semi-annual meeting, Buffalo, N. Y., June 20-22. Secretary, J. C. Olsen, Cooper Union, New York City.

Electrical Contractors' Association of the State of Illinois. Annual meeting, Peoria, Ill., June 22-23, Secretary, L. B. Van Nuys, Peoria, Ill.

American Institute of Electrical Engineers. Annual convention, New York, N. Y., June 27-28. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

National Electrical Credit Association. Annual meeting, Boston City Club, Boston, Mass., June 28-29. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

## SOUTH CENTRAL STATES.

HAZARD, KY.—The Kentucky River Power Company contemplates constructing an electric transmission system from Lothair power plant into Lott's Creek field to furnish electricity to coal mines. Address manager.

MYRTLEWOOD, ALA.—The Marengo County Telephone Company has been incorporated with $2,000 capital by F. C. Carter.

ALTUS, OKLA.—The city council is planning to increase the city's water supply and proposes to buy land east of the present reservoir and build a dam.

BINGER, OKLA.—Robert Baker is figuring on the probable cost of installing an electric light plant in connection with his mill.

COLLINSVILLE, OKLA.—The city contemplates improving electric light plant, including the installation of machinery, to cost $14,000. Address the mayor.

CUSHING, OKLA.—The Oil Field Water, Light & Power Company has been organized with a capital stock of $250,000. Its purpose is to furnish electric light and power to the cities of Drumright, Cushing, Yale, Stillwater and other surrounding towns. It will also supply power to pump the wells in the Cushing oil fields.

GRANDFIELD, OKLA.—The city council has voted to furnish current to construct a white way here. Business men will install the posts.

HEALDTON, OKLA.—The Consumers' Light & Power Company will erect a substation and plans to transmit electricity over high-tension line from the Ardmore plant.

LIMA, OKLA.—The People's Telephone Company has been chartered with a $5,000 capital stock, by J. K. Hubbard, R. G. Dunlay and G. V. Gross.

MANGUM, OKLA.—Engineer Griffin of Ft. Worth, Tex., is drawing plans for the municipal light and power plant which has been provided for by a recent bond election.

WELLSTON, OKLA.—The Spring Valley Union Rural Telephone Company has been incorporated with George W. Spence, manager.

ALICE, TEXAS.—The Alice Electric & Ice Company will install a new engine and make other improvements to its plant. The company has just completed the construction of an extension of its transmission system to San Diego, Texas, and contemplates building lines to other towns of this section.

AUSTIN, TEXAS.—The Austin Electric Company will extend its South Austin street railway line to the Fairview Park suburb as soon as its order for steel and wire can be filled.

FORT BLISS, TEXAS.—The War Department has asked for bids for furnishing electric lights for the new cantonments that are being built here for the accommodation of troops. J. N. Gladding, city engineer of El Paso, is preparing estimates of the cost of the proposed system.

PAINT ROCK, TEXAS.—The Interstate Electric Company of San Angelo will construct an electric transmission line to Paint Rock.

ROSENBERG, TEXAS.—The Fort Bend Telephone Company has been incorporated with $30,000 capital. C. H. Wadden, manager.

STAMFORD, TEXAS.—The Hydro-Electric Metallic Battery Company, which has been incorporated here with a capital stock of $20,000, will use the electrical process for mining and treating copper ore in its mines near here. C. L. Pittman is a stockholder.

## WESTERN STATES.

GRASS RANGE, MONT.—The Grass Range Farmers' Telephone Company has been incorporated here.

MISSOULA, MONT.—Eleven miles of new telephone line will be built in Helena national forest after July 1. This action was decided on at a conference between Supervisor J. B. Seely of the Helena forest and R. B. Adams, district telephone superintendent for the national forest with headquarters at Missoula. The new line will be built from Townsend east, up Deep Creek, along the public road. The line is to connect the Deep Creek ranger station 14 miles from Townsend. Three miles of this road was built last year.

DOUGLAS, ARIZ.—The City Council has directed the City Clerk to advertise for bids for the installation of an ornamental lighting system in the Tenth Street park.

MESA, ARIZ.—Plans are under way by the city for the purchase of the South Side Gas & Electric Company's plant.

NOGALES, ARIZ.—W. F. Neill proposes to install a telephone system to serve the Vaughn-Elgin district.

BOVILL, IDAHO.—An election will be held here on June 9 to vote on a bond issue of $5,500 for the purpose of installing a municipal electric lighting plant.

HAILEY, IDAHO.—The Mountain States Telephone & Telegraph Company will rebuild the Hailey-Shoshone toll line this summer. The line will be straightened and rebuilt along the state highway and all short or otherwise defective poles will be replaced, making the line practically new.

LEWISTON, IDAHO.—The Washington-Idaho Water, Light & Power Company has been granted a 25-year franchise to construct and operate a system in this city for furnishing light and power.

POCATELLO, IDAHO.—The City Council has taken under consideration a proposition submitted by Joseph Burns, whereby he is to install and maintain for a period of 20 years a power plant and distributing system and at the end of that period sell it to the city.

OTHELLO, WASH.—A movement has been started for the installation of an electric light plant.

PALOUSE, WASH.—The town of Dearu, at a special election, voted bonds for the construction of a municipal light plant.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company will soon start work on a substation at First Avenue South and Spokane Street, which will represent an expenditure of $12,000.

SEATTLE, WASH.—The Snokomish Power Company has been incorporated with a capital stock of $1,000,000 by G. H. Tilden, W. H. Wynn, Jr., and H. W. Bunker.

HALFWAY, ORE.—Council has passed an ordinance granting Idaho Power Company a franchise to operate in this town.

MARSHFIELD, ORE.—Work is to begin at once on the construction of a transmission line from the Smith mills to Coquille and Myrtle Point by the Oregon Power Company at a cost of about $26,000.

NORTH BEND, ORE.—A. L. Martin, manager of the Oregon Power Company, has received word from Chicago to proceed with the plans for building an extension line to Coquille. He has also been instructed to build a system in East-

side, where the company recently was given a franchise.

PORTLAND, ORE.—The Portland Railway, Light & Power Company has been granted a 25-year franchise to maintain a transmission line along the Columbia Highway.

BETTERAVIA, CAL.—The State Railroad Commission has authorized the San Joaquin Light & Power Company to construct a two-mile transmission line connecting its electric plant at this place to the line of the Midland Counties Public Service Corporation.

LATON, CAL.—Articles of incorporation have been filed for the Laton Telephone Company.

LODI, CAL.—The Lodi Business Men's Association has accepted a design submitted by the city engineer for electroliers to be used in the residence district and installation work will be started soon.

OAKLAND, CAL.—The Pacific Tank & Pipe Company has been granted a permit to construct a power house at a cost of $3,000.

RIVERSIDE, CAL.—The city council has passed a resolution providing for the improvement of Chestnut Street from First to Sixth Street by the installation of a lighting system.

SAN FRANCISCO, CAL.—City officials and the United Railroads have effected a compromise whereby the municipal railways can use the poles and span wires of the United Railroads on Market Street and Van Ness Avenue.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company has been authorized by the State Railroad Commission to use $43,824 of the proceeds obtained from the sale of $1,000,000 of bonds to reimburse its treasury for capital expenditure.

SAUSALITO, CAL.—The Pacific Telephone & Telegraph Company has applied to the city trustees for a franchise. Sealed bids will be received for such a franchise up to July 16.

VALLEJO, CAL.—The Vallejo Electric Light & Power Company has filed an application with the State Railroad Commission for a certificate that public convenience and necessity require it to exercise the rights granted under a franchise by the County of Solano. The company states its intention of extending its system to the Vallejo Annex, where a tract of 77 acres is being offered for sale in lots.

VENTURA, CAL.—Steps have been taken here looking toward the construction of an ornamental street-lighting system, such as has been decided upon by the towns of Oxnard and Fillmore.

## PROPOSALS

LIGHTING FIXTURES.—Sealed proposals will be opened at the office of the Supervising Architect, Treasury Department, Washington, D. C., on June 20, for furnishing and installing lighting fixtures in the United States post offices at Ashland, O., Bonne Terre, Mo., Buckhannon, W. Va., Charlotte, Mich., Dowagiac, Mich., Evansville, Ind., Middletown, Conn., Nacogdoches, Tex., Skowhegan, Me., Warrenton, Va., Washington, Ind., and Yoakum, Tex., in accordance with drawings and specifications, copies of which may be had at the above named office. Proposals are desired only from those qualified to produce work of the highest grade, both artistically and mechanically. Jas. A. Wetmore, acting supervising architect.

MOTOR-DRIVEN MACHINERY.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for the following motor-driven machinery at early dates not yet specified. Intending bidders should apply to the Bureau for copies of the schedules mentioned. One four-motor 15-ton overhead traveling crane for delivery at Washington, D. C., schedule No. 1192; one 16-inch high-speed sensitive drill, Brooklyn, N. Y., schedule 1199; one steam-turbine-driven generator, Annapolis, Md., schedule 1198; one back-geared extension screw-cutting lathe, Brooklyn, schedule 1199; two flat-turret lathes, 2¼ by 24 inches, Philadelphia, Pa., schedule 1188; one gate shear, Norfolk, Va., schedule 1187.

PORTABLE LAMPS.—Sealed bids will be received at the Treasury Department, Supervising Architect, Washington, D. C., June 28, for supplying the various federal buildings, marine hospitals and quarantine stations under the control of the Treasury Department, with portable desk lamps during the fiscal year ending June, 1918, in accordance with plans on file. Address James A. Wetmore, architect.

MOTOR-DRIVEN PUMPS.—Sealed bids will be received June 12 for the improving of the municipal water works plant at Kendallville, Ind. Specifications include one motor-driven low-service centrifugal pump, one motor-driven domestic-service centrifugal pump, one motor-driven fire-service centrifugal pump, two duplicate motor-driven centrifugal force pumps. Address O. E. Michaelis, city clerk.

ELECTRICAL WORK.—The Board of Public Education of Pittsburgh, Pa., will receive bids up to 3 p. m., June 14, for electrical work at the Latimer School. George W. Gerwig, secretary, office of the Superintendent of Buildings, Fulton Building.

ELECTRICAL WORK.—The Board of Education, West New York, N. J., will receive bids up to 8 p. m., June 13, for electrical work in the new addition to be erected to Public School No. 5. William Mayer, Jr., 711 Bline Avenue, West New York, is architect; Harry Kuhlke, clerk of board.

ELECTRICAL WORK.—The Department of Architecture, State House, Trenton, N. J., will receive bids until 12 noon, June 22, for electrical work in a new building at the Industrial School, Bordentown. Francis H. Bent is state architect.

ELECTRIC PUMPING STATION.—The Passaic Valley Sewerage Commission will receive bids up to July 10 for a new pumping station for the system near Scott Avenue, Wallington section. Joseph H. Quigg, clerk, 31 Clinton Street, Newark, N. J.

ELECTRICAL WORK.—The Board of Education, Englewood, N. J., will receive bids until 8:30 p. m., June 14, for electrical work in the new Lincoln School to be erected on Englewood Avenue. Guilbert & Betelle, 665 Broad Street, Newark, architects; A. S. Coe, secretary of the board.

## FINANCIAL NOTES

One of the handicaps which public utilities in general are now facing is restricted sales due to non-delivery of machinery and apparatus. This would not be so serious were it not for the fact that many utility companies are depending on increasing business to keep up their profits. There is little or no difficulty selling power to industrial concerns and large current consumers, but there are great difficulties in supplying the apparatus so consumers can make use of the current.

A number of utility companies have made it their practice to keep a considerable amount of surplus apparatus in stock, filling orders or replacing equipment immediately. These stocks have been reduced to insignificance through the demands of new business. The waiting list for apparatus is so large that delivery is long delayed, and by the time the equipment is received the company has lost money from business it might have had.

Some traction companies started to sell surplus power in 1916 and made good headway in this direction, but their expansion has been greatly restricted by late delivery of equipment. The same is true of telephone, hydroelectric and steam power companies. This, added to the freight car shortage and labor difficulties, has had its share in raising the operating ratios of the utility companies and restricting profits.

President Thomas N. McCarter of the Public Service Corporation, Newark, N. J., has issued a notice to employees urging the purchase of liberty bonds, adopt-

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRIC COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

| Public Utilities— | Div. rate per cent. | Bid May 28. | Bid June 5. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | .. | 20 | 20 |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 76 | 76 |
| American Gas & Electric of New York, common | 10+extra | 123 | 120 |
| American Gas & Electric of New York, preferred | 6 | 49 | 48½ |
| American Light & Traction of New York, common | . | 318 | 329 |
| American Light & Traction of New York, preferred | 6 | 110½ | 110 |
| American Power & Light of New York, common | 4 | 67 | 67 |
| American Power & Light of New York, preferred | 6 | 89 | 89 |
| American Public Utilities of Grand Rapids, common | .. | 30 | 28 |
| American Public Utilities of Grand Rapids, preferred | 6 | 63 | 64 |
| American Telephone & Telegraph of New York | .. | 122¼ | 122¼ |
| American Water Works & Elec. of New York, common | .. | 7 | 7¼ |
| American Water Works & Elec. of New York, particip. | 7 | 22 | 22 |
| American Water Works & Elec. of New York, first preferred | .. | 76 | 75 |
| Appalachian Power of Bluefield, common | .. | 5 | 5 |
| Appalachian Power of Bluefield, preferred | 7 | 30 | 30 |
| City Service of New York, common | 6+extra | 289 | 288 |
| City Service of New York, preferred | 6 | 86 | 87 |
| Commonwealth Edison of Chicago | 8 | 121 | 121 |
| Comm. Power, Railway & Light of Jackson, common | 4 | 49 | 48 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 74 | 74 |
| Federal Light & Traction of New York, common | .. | 11 | 10 |
| Federal Light & Traction of New York, preferred | .. | 43 | 43 |
| Illinois Northern Utilities of Dixon | 6 | 78 | 78 |
| Middle West Utilities of Chicago, common | 2+2 extra | 43 | 42 |
| Middle West Utilities of Chicago, preferred | 6 | 68 | 68 |
| Northern States Power of Chicago, common | 7 | 89½ | 92 |
| Northern States Power of Chicago, preferred | 7 | 98 | 98 |
| Pacific Gas & Electric of San Francisco, common | 5 | 56 | 59 |
| Pacific Gas & Electric of San Francisco, preferred | 6 | 89 | 89 |
| Public Service of Northern Illinois, Chicago, common | 7 | 93 | 90 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 96 | 95 |
| Republic Railway & Light of Youngstown, common | 4 | 30½ | 30½ |
| Republic Railway & Light of Youngstown, preferred | 6 | 65¼ | 66 |
| Standard Gas & Electric of Chicago, common | .. | 10½ | 10 |
| Standard Gas & Electric of Chicago, preferred | 6 | 36 | 35 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 5½ | 5¾ |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 25 | 25¼ |
| United Light & Railways of Grand Rapids, common | 4 | 39 | 38 |
| United Light & Railways of Grand Rapids, preferred | 6 | 69½ | 69 |
| Western Power of San Francisco, common | .. | 15 | 14 |
| Western Power of San Francisco, preferred | 6 | 48 | 51 |
| Western Union Telegraph of New York | 5+extra | 93 | 94½ |
| Industrials— | | | |
| Electric Storage Battery of Philadelphia, common | 4 | 62 | 61½ |
| General Electric of Schenectady | 8 | 162 | 164 |
| National Carbon of Cleveland, common | 8 | •75⅝ | • |
| National Carbon of Cleveland, preferred | 7 | •133 | • |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 5+extra | 54⅝ | 53⅞ |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | 67 | 68¾ |

•Last sale.

ing as a slogan "Every Employee a Bond Buyer." The company has arranged to accept subscriptions for any amount of bonds from $50 upwards, with payment from employees at the rate of $1 per week or $5 per month for each $50 face value of bonds desired. The installments will be payable on regular pay days of the weekly and monthly employees respectively.

W. S. Barstow & Company, 50 Pine Street, New York, operating electric light and power properties in New Jersey, Vermont, Pennsylvania and other sections, have devised plans for their individual companies to purchase bonds for the account of employees from $50 upwards, with payments on the installment plan, weekly or monthly basis, extending over a period of one year. In practically all cases arrangements will be made with local banks to carry the bonds to enable employees to derive the benefit of the 3½ per cent interest when payments are defrayed.

Employees of the Thomas A. Edison Companies, West Orange, N. J., are conducting an aggressive campaign to raise at least $300,000 for the liberty loan. On June 1 a large electric torch, about 15 feet high, the symbol of the Edison Liberty Loan Club, was unveiled on Building No. 21 with appropriate ceremonies in the presence of about six thousand employees. The torch is located close to a large electric flag presented to Mr. Edison by employees some months ago, and carries the wording "Edison Liberty Loan Club." An indicating thermometer has been constructed in connection with the torch to register the amount of subscriptions from day to day.

# Electrical Patents Issued May 29, 1917

**Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.**

1,227,568. **Electric Switch.** F. N. Barber, assignor to Electric Controller & Mfg. Co. Structure of electromagnetically operated device.

1,227,571. **Electric Motor.** G. Blumberg and J. A. Butkus, Baltimore, Md. Has unwound field magnets supported by diamagnetic structure and making acute angles with axis of armature, the last having a commutated winding.

1,227,582. **Telephone-Exchange System.** H. P. Clausen, assignor to Western Electric Co., New York, N. Y. Arrangement of busy test in manual system.

1,227,588. **Electrical Connector.** J. Cuthbert, Chicago, Ill. Structure of plug.

1,227,603. **Method and Apparatus for Electrically Heating Pipe-Blanks.** C. Fox, assignor to C. Mark and A. Mark, Chicago, Ill. Manner of electrically heating blank edges by resistance method preparatory to welding.

1,227,605. **Electric Switch.** J. Friis, assignor to T. Cusack Co., Chicago, Ill. Structural details of automatic switch.

1,227,609. **Telephone-Exchange System.** C. L. Goodrum, assignor to Western Electric Co. Automatic.

1,227,623. **Automatic Light-Controlled Film-Printing Apparatus.** D. Horsley, Bayonne, N. J. Intensity of light controlled by rheostat controlled by film.

1,227,637. **Electric Heater.** J. F. McElroy, assignor to Consolidated Car-Heating Co. Structure of car heater.

1,227,659. **Wire-Coiling Apparatus.** C. H. Quackenbush and J. C. Smedley, assignors to General Electric Co. The coil wire is measured and fed to the mandrel wire and the relative rotation of the mandrel wire and coil wire support is controlled by the feeding and measuring means.

1,227,686. **Electric Sign.** J. R. Stark and M. S. Harwell, Nashville, Tenn. A figure of non-opaque material contains light bulbs and is seated in a swing movable in a hollow frame.

1,227,694. **Lamp.** R. H. Tatlow, Jr., Denver, Colo. Arrangement of reflectors in non-glaring headlight.

1,227,697. **Ignition Apparatus for Hydrocarbon-Engines.** M. Tibbetts, assignor to Packard Motor Car Co., Detroit, Mich. Mounting of receptacle for ignition apparatus on dash of vehicle.

1,227,699. **Spark-Plug.** J. E. Trahan, Detroit, Mich. Structural details.

1,227,606. **Process of Making Glyoxylic Acid or Its Compounds.** M. Vaygouny, assignor to Royal Baking Powder Co. Potassium amalgam is produced by electric current and portions are continuously transferred into contact with a solution containing dissolved oxalic acid.

1,227,721. **Electrically Heated Utensils.** L. H. Wilkinson and W. G. Barker, assignors to Manning Bowman & Co., Meriden, Conn. Mounting of heater whereby it is spring pressed against bottom of container.

1,227,726. **Cable-Terminal.** D. Woodhead, assignor to Central Electric Co., Chicago, Ill. Method of securing connecting terminal to end of conductor having acidproof insulation.

1,227,735. **System for Connecting Telephone Stations.** L. D. Barrows and H. P. Charlesworth, assignors to American Telephone & Telegraph Co. Lock-out arrangement for party line.

1,227,747. **Speedometer.** A. A. Canton, assignor to Device Testing Co. Two magnets of different strengths, one constant and the other having its strength increased by an intermittent current proportional to the speed, act on the pointer armature.

1,227,752. **Fusible Element for Enclosed Electric Fuses.** R. C. Cole, assignor to Johns-Pratt Co., Hartford, Conn. Has a number of fusible links separated at their ends and brought together midway.

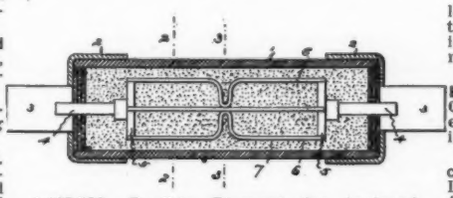
1,227,753. **Fuse-Block.** R. C. Cole, assignor to Johns-Pratt Co. Manner of securing the fuse clips.

1,227,760. **Thermoregulator.** A. de Khotinsky, assignor to Central Scientific Co., Chicago, Ill. Structure of thermally operated contact device employing a thermally responsive, electrically conducting liquid.

1,227,766. **Sustaining Device for Vapor-Converters.** S. W. Farnworth, assignor to Westinghouse Electric & Mfg. Co. Structure and arrangement of keep-alive anode.

1,227,771. **Battery-Charging Equipment.** E. T. Foote, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Arrangement of resistance controlling switch.

1,227,772. **Electric Distributing System.** C. LeG. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Arrangement of reactance in trolly feeder connections.



1,227,752.—Fusible Element for Inclosed Fuse.

1,227,777 and 1,227,778. **Signal.** R. M. Gilson, assignor to Union Switch & Signal Co., Swissvale, Pa. First patent: Light projector comprising a refraction device for use on railway curves. Second patent: Modification.

1,227,789. **Electric Switch.** A. J. Horton, assignor to Cutler-Hammer Mfg. Co. Knife blade structure for a storage battery circuit.

1,227,790. **Control-Panel.** A. J. Horton, assignor to Cutler-Hammer Mfg. Co. For charging batteries.

1,227,795. **Dimmer for Motor Vehicles.** H. O. Johnson, assignor of one-half to A. E. Noack, Sacramento, Cal. Combination with a headlight reflector of a translucent envelope.

1,227,801. **Electric Switch.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Two-push-button snap; for lamp sockets.

1,227,809. **Method of and Means for Transforming Direct Current.** J. C. Lincoln, assignor to Lincoln Electric Co., Cleveland, O. Structure and winding of dynamoelectric machine.

1,227,810. **Motor-Control System.** W. O. Lum, assignor to Westinghouse Electric & Mfg. Co. Electromagnetic resistance control.

1,227,815. **System of Control.** F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. On single-phase circuit, motor is operated as direct current through rectifier and then as induction motor with rectifier in secondary for speed control.

1,227,830. **Process of Uniting Metal Bodies.** A. W. Richards, assignor to Hydraulic Pressed Steel Co., Cleveland, O. Process of heading metal barrels by electric welding.

1,227,833. **Automatic Ball Racking Device for Billiard Tables.** J. B. Russell, Chicago, Ill. Runways from tables to racks are electromechanically controlled by ball-operated contacts.

1,227,837. **Electric Contact-Box.** A. W. Sclater, Piccadilly, Westminster, Eng. Details of construction.

1,227,844. **Variable-Voltage Transformer.** A. Simon, assignor to Cutler-Hammer Mfg. Co. Core has an adjustable armature.

1,227,884. **X-Ray-Tube Apparatus.** E. W. Caldwell, New York, N. Y. Structure and arrangement of shield.

1,227,895. **Telephone-Exchange System.** B. G. Dunham, assignor to Western Electric Co. Automatic.

1,227,904. **Contact-Bank for Automatic Switching Devices.** C. L. Goodrum and H. F. Dobbin, assignors to Western Electric Co. Structure of device for use in telephone systems.

1,227,918. **Plug and Receptacle Connector.** L. O. Lieber, Los Angeles, Cal. Ball causes plug to move outwardly when it is turned.

1,227,921. **Electric Regulator.** G. Machlet, Jr., Elizabeth, N. J. Current for electric furnace is regulated by voltmeter in a circuit having an element in the furnace.

1,227,931. **Electric Signaling System for Electric Railways.** F. M. Raymond and C. H. Dare, Saugatuck, Conn. Details of electrically controlled operating mechanism for a semaphore.

1,227,932. **Automatic Telephone-Exchange System.** F. N. Reeves and A. E. Lundell, assignor to Western Electric Co. Arrangement of main and satellite offices.

1,227,936. **Telephone-Plug Ejector.** H. B. Rodier, assignor of one-fourth to I. N. Boernstein, one-fourth to P. Koester and one-fourth to R. B. Gotta, Washington, D. C. Circuits of solenoid for automatically ejecting a plug.

1,227,975. **Signal Device.** W. W. Steffy, Kutztown, and H. B. Steckel, Slatington, Pa. Structure of device having electromagnetically operated pointer.

1,227,979. **Ignition Control.** C. C. Trump, assignor to Humphrey Gas Pump Co. Impact of liquid is utilized to make and break a circuit.

1,227,996. **Ignition System.** W. A. Chryst, assignor to Dayton Engineering Laboratories Co. Manner of mounting resistance and controlling contacts on interrupter casing.

1,228,000. **Tone-Producer for Fire-Alarm-Box Mechanisms.** D. G. Dee, assignor to R. H. Rogers, Rochester, N. Y.

1,228,003 and 1,228,004. **Reflector-Holder.** H. D'Oliver, Jr., Bridgeport, Conn. First patent: For attachment to lamp socket. Second patent: Modification.

1,228,007. **Connector Repeater Switch of Automatic Telephone-Exchanges for Handling Fire-Alarm Calls.** J. Erickson, assignor to R. H. Rogers, Rochester, N. Y. Details of arrangement and structure.

1,228,014. **Driving Device for Talking Machines.** J. Frier, St. Louis, Mo. Mounting and gearing of electric motor.

1,228,126. **Lamp-Socket and the Like.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Has special structure of resilient shell and insulation of conductors from cap.

1,228,027. **Casing for Lamp Sockets or the Like.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Relates to interlock of cap and shell.

1,228,028. **Casing for Lamp-Sockets and the Like.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Modification of above.

1,228,030. **Control System.** H. C. Knerr, Primos, Pa. Signaling system; details of

electromagnetically controlled switches and circuits.

**1,228,032. Method of Electric Welding and Apparatus.** L. S. Lachman, assignor to Universal Electric Welding Co., New York, N. Y. For welding pieces tending to heat at different rates by the contact electrode process.

**1,228,052. Electric Switch.** J. H. Rusby, Nutley, N. J. Two-push-button, flush, wall switch.

**1,228,058. Electric Relay.** F. W. Schmidt, assignor to Time-Systems Co., Portland, Me. Structural details.

**1,228,061. Device for Damping Oscillations of a Gyroscope-Pendulum.** M. Schuler, assignor to Anschutz & Co., Neumuhlen, near Kiel, Germany. Electric motor having circuit controlled by pendulum exerts a turning movement on gyroscope to counteract the oscillations thereof.

**1,228,065. Current-Indicating Apparatus for Direct-Reading Wave-Meters for High-Frequency Oscillations.** G. Seibt, assignor to General Transmission Co., New York, N. Y. Comprises an incandescent lamp for indicating the current in the meter circuit and a member inductively related to the meter and having a pointer, and means for varying the inductive effect.

**1,228,075. Controlling System for Electric Elevators.** W. S. Smith, Cambridge, Mass. Automatic system.

**1,228,078. Recording-Sampler.** A. E. Truesdell, Adams, Mass. Time-controlled electric means periodically release the sample receiving element to permit it to rotate one step forward.

**1,228,095. Signaling Device.** J. R. Casper, Washington, D. C. Solenoid operated semaphores for automobiles.

**1,228,097. Electric Relay.** J. B. Crippen, assignor to General Engineering & Construction Co., Ltd., Toronto, Canada. Polarized alternating current device.

**1,228,127. Conduit Outlet-Box.** E. A. Olley, assignor to Crouse-Hinds Co., Syracuse, N. Y. Structural details.

**1,228,132. Fountain-Pen Light.** F. Rauch, Springfield, Mass. Structure of battery flash light mounted on pen.

**1,228,142. High-Tension Insulator-Support for Busbars.** E. O. Sessions, Chicago, Ill. Structure of supporting clamp.

**1,228,155. Pothead.** P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Details of construction.

**1,228,156. Connector for Electrical Conductors.** P. F. Williams, assignor to G. & W. Electric Specialty Co. Structure of pothead.

**1,228,167. Auxiliary-Supervisory-Signal System.** H. M. Bascom, assignor to American Telephone & Telegraph Co. For telephone systems.

**1,228,168. Automatic Block-Signal Apparatus.** V. W. Baumgartner, Salt Lake City, Utah. Detailed circuit arrangements for railway systems.

**1,228,169. Manufacture of Electrodes.** E. H. Becker, assignor to Kinetic Electric Co., Norfolk, Va. Copper oxid electrode and method of making.

**1,228,173. Paper-Feed-Controlling Apparatus.** T. J. Beregh, Jr., assignor of one-half to C. Francis, New York, N. Y. Plungers controlling circuits are released by any unduly thickened portion of paper.

**1,228,180. Electrically Heated Shoe Iron.** E. N. Chandler, assignor to Boston Last Co., Boston, Mass. Hammering and burnishing tool for finishing shoes.

**1,228,187. Automobile-Signal.** S. H. Davis, Roanoke, Va. Detailed circuits for front and rear end visual signals.

**1,228,188. Pressure-Regulator.** F. S. Denison, assignor to Minneapolis Heat Regulator Co., Minneapolis, Minn. Motor circuit is controlled by thermostat and pressure gage.

**1,228,193. Letter-Box.** A. H. Ewing, Salt Lake City, Utah. Circuit is controlled by mail insertion door and mail removal door.

**1,228,195. Automatic Circuit-Closer for Electric Heaters.** M. H. Farley, assignor of one-half to A. W. Kah, Seattle, Wash. Structure of thermostatic device.

**1,228,201. Elevator-Door Mechanism.** F. C. Furlow, assignor to Otis Elevator Co., Jersey City, N. J. Landing gate is electrically controlled by a series of movable floor sections.

**1,228,206. Trolley.** G. D. Harlow, St. Louis, Mo. Wheel is yieldingly held against rotation in one direction and rotates freely in other direction.

**1,228,222. Electric Switching Mechanism.** F. B. Little, assignor to J. C. Deagan Musical Bells, Chicago, Ill. Arrangement of manual keys and switches for selectively controlling sound producing devices.

**1,228,223. Electromechanical Action for Musical Instruments.** F. B. Little, assignor to J. C. Deagan Musical Bells. For percussion musical instruments.

**1,228,226. Diaphragm-Horn.** D. A. McConnell, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Details of motor operated structure.

**1,228,241. Spark Plug.** J. Platt, Milford, Conn. Structural details.

**1,228,243. Water-Heater.** F. Poole, Jewell, Kans. Electrical device for interposing in a pipe line.

**1,228,250. Storage Battery Construction.** J. M. Skinner, assignor to Philadelphia Storage Battery Co., Phila., Pa. Grid for pasted plate.

**1,228,263. Lighting and Signaling System for Vehicles.** J. A. Topping, Chicago, Ill. Direction indicator.

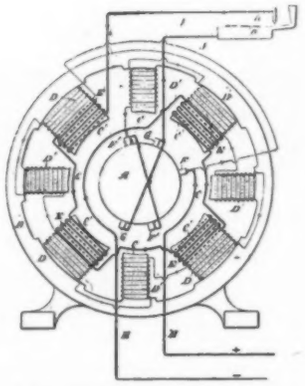
**1,228,290. Electrically Controlled Calculating-Machine.** J. W. Bryce, Brooklyn, N. Y. Contacts are controlled by workman's punched time card.

**1,228,293. Attachment for Electric-Light Snap-Switches.** F. Cailleteau, Atlanta, Ga. To adapt for pull operation.

**1,228,325. Gage.** J. W. Joachim, New Orleans, La. Fluid in a tube shifts a magnet as it changes and magnetically moves an arm which operates an indicator.

**1,228,330. Outlet-Box.** C. H. Loughridge and H. R. Loughridge, Pittsburgh, Pa. Has an adjustable, telescoping, terminal shell.

**1,228,337. Electrical Attachment-Plug.** P. S. McLean, Bloomfield, N. J. Structural details.



**1,227,809.—Rotary Converter.**

**1,228,349. Electric Insulator.** A. R. Muller, Walthamstow, England. Two-part, pin type, for clamping wire.

**1,228,354. Electrical Fuse.** H. W. Young, Chicago, Ill. Structure of enclosed fuse.

**1,228,362. Switchboard or Mounting.** J. P. Hayes, assignor of one-half to J. E. Barnhart, Pittsburgh, Pa. Arrangement of switches and busbars.

**1,228,364. Automatic Pilot Mechanism.** A. J. Macy, Chicago, Ill. Vehicle steering mechanism is electrically controlled by compass needle.

**1,228,368. Wood Separator for Storage Battery Plates.** W. Morrison, assignor to Vesta Accumulator Co. Separators are treated with solution of barium hydroxid, which is then converted into barium sulphate.

**1,228,369. Separator for Storage-Battery Plates.** W. Morrison, assignor to Vesta Accumulator Co. Has strontium sulphate in its pores.

**1,228,371. Process of Producing Insulating Materials.** E. Haefely, assignor to Westinghouse Electric & Mfg. Co. Process coating a fabric with mica flakes.

## Patents Expired.

The following United States electrical patents expired on June 5, 1917:

650,836. Telegraph Sounder. F. Hatmaker, Pittston, Pa.

650,842. Electrically Controlled Winding Mechanism for Time Locks. W. H. Hollar and A. L. Rhodes, Philadelphia, Pa.

650,860 to 650,862. Electrical Connector and Method of Making Same. T. J. McTighe, New York, N. Y.

650,872. Electric Arc Lamp. W. L. Silvey, Dayton, O.

650,878. Trolley. F. B. Torrey, Bridgeport, Conn.

650,885. Electric Storage Battery and Conducting Plate Therefor. S. L. Wiegand, Philadelphia, Pa.

650,886. Secondary Battery. S. L. Wiegand.

650,888. Electric Arc Lamp. J. J. Wood, Fort Wayne, Ind.

650,893. Automobile. A. S. Buffington, Minneapolis, Minn.

650,904. Trolley. C. H. McGwire, Denver, Colo.

650,905. Electrical Glow Light with Second-class Conductors. K. Ochs, Berlin, Germany.

650,906. Motor Wheel. E. Perks, Coventry, England.

650,915. Relay for Telephone Lines. C. E. Scribner, Chicago, and F. R. McBerty, Downers Grove, Ill.

650,928. Suspension Clamp for Electric Conductors. I. J. Crowley, Chicago, Ill.

650,929. Contact Box for Electric Railways. A. Diatto, Turin, Italy.

650,952. Electric-railway System. W. Robinson, Boston, Mass.

650,972. Electric Conductor. L. Hackethal, Hanover, Germany.

650,973. Electrical System for Watertight Doors. G. H. Hill, East Orange, N. J.

650,987. Electric Conductor. O. P. Ostergren, New York, N. Y.

650,995. Electric Punka Motor. H. Spuhl, St. Gall, Switzerland.

650,997. Electric-railway System. J. M. Taylor, Omaha, Neb.

651,004. Water-tight Bulkhead Door. F. T. Bowles, New York, N. Y.

651,013. Electric Telegraphy. I. Kitsee, Philadelphia, Pa.

651,014. Space Telegraphy. I. Kitsee and C. E. Wilson, Philadelphia, Pa.

651,033. Manufacture of Electrical Conductors. G. W. Gesner, New York, N. Y.

651,044. Time Damper-operating Mechanism. W. D. King, Peabody, Mass.

651,055. Trolley. W. B. Potter, Schenectady, N. Y.

651,063. Insulated Contact or Terminal for Electric Circuits. C. C. Badeau, Schenectady, N. Y.

651,067. Electric Gas-lighting Apparatus. W. R. Cram, Boston, Mass.

651,089. Process of Producing Positive Plates for Batteries. H. Strecker, Cologne, Germany.

651,112. Electric Controller for Railway Switches. H. A. Gorn, New York, N. Y.

651,135. Instrument for Determining Amount of Elongation and Compression of Railway Rails under Moving Trains. P. H. Dudley, New York, N. Y.

651,140. Trolley Replacer. J. Goldsworthy, Indianapolis, Ind.

651,163. System of Day Signaling. B. A. Fiske, U. S. Navy.

651,167. Manufacture of Carbide of Calcium. J. E. Hewes, Baltimore, Md.

651,179. Germ Arrester for Mouthpieces of Telephones, Speaking Tubes, Etc. C. J. Branch, Philadelphia, Pa.

651,198. Telephone Transmitter, J. M. Moore, Chatham, Ill.

651,247. Chemical Electric Generator. H. K. Ness, Syracuse, N. Y.

651,248. Carbon and Globe Holder for Arc Lamps. A. Holliger, New York, N. Y.

651,260. Ship's Log. A. N. McGray, Boston, Mass.

651,263. Electric-railroad Switch. T. A. Rhodes, Jr., Langdon, D. C.

651,325. Electric Burglar-Alarm System. J. F. Dorsey, Washington, D. C.

651,326. Electrical Hose-signaling Apparatus. W. Fowler, Colorado Springs, Colo.